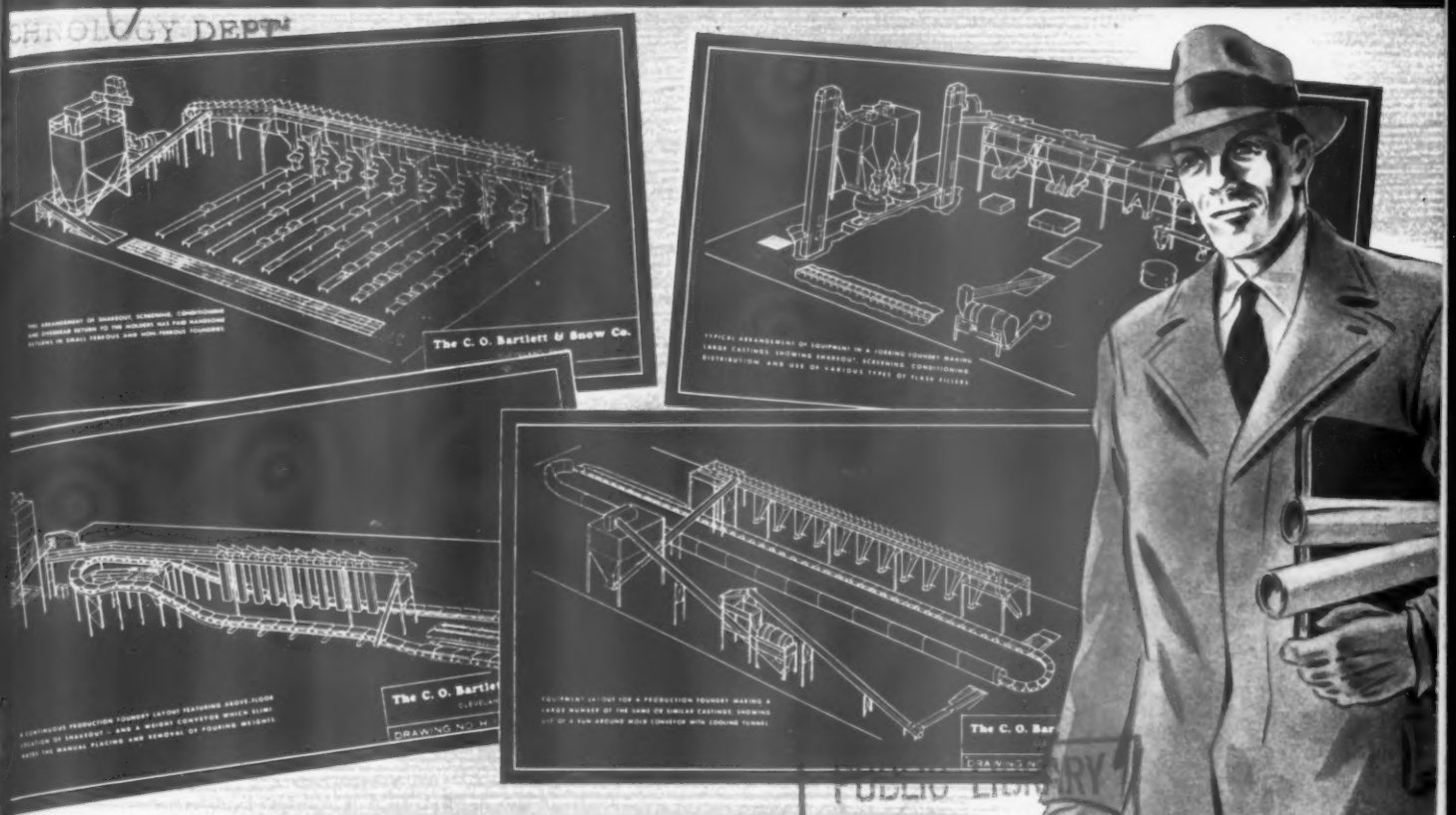
FOUNDRY



Mechanized Sand, Mold and Castings Handling . . . TO KEEP YOU COMPETITIVE

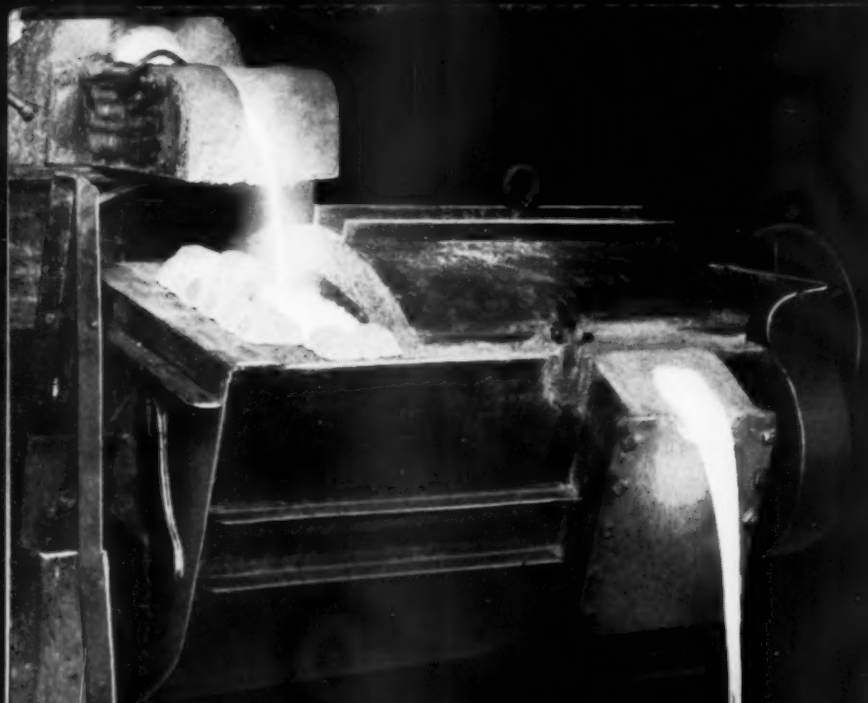
PROFITABLE BUSINE$$—requires that there be $ales—at a profit—which in turn requires that plant costs must be competitive . . . Bartlett-Snow Foundry Engineers have a solution. With an unparalleled record of successes in mechanizing gray iron, malleable, steel and non-ferrous foundries, they can—by handling and processing materials mechanically—increase the output per man—improve working conditions, making the men's work easier—reduce defectives—reduce costs—and broaden the possible market . . . Let's sit down together now,—and save many precious months of those difficult days ahead.

THE C. O. BARTLETT & SNOW CO.

6201 HARVARD AVENUE • CLEVELAND 5, OHIO

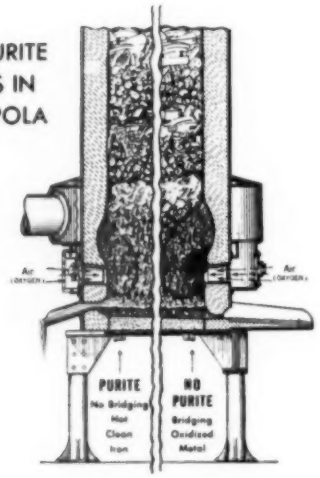
Engineering and Sales Representatives in the Principal Cities

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT • DUST AND FUME CONTROL SYSTEMS



SPEED PRODUCTION OF SOUNDER CASTINGS

HOW PURITE WORKS IN THE CUPOLA



PURITE keeps the tuyeres open and bright during long heats and prevents bridging — gives a clean drop at the finish.

PURITE restricts the combustion zone to a smaller, hotter area in front of the tuyeres — prevents oxidation of the metal charge.

To insure sounder, better machining castings, use Purite

Refining with Purite, whether in the cupola or in a mixer ladle, removes inclusions, desulphurizes and helps prevent losses due to segregation of impurities.

Purite increases the fluidity and activity of the slag, speeds up combustion and reduces oxidation of the metal.

Purite pays real dividends in better cupola operations and cleaner, better casting metal.

THE SCIENTIFIC FLUX FOR BETTER MELTING AND CLEANER IRON

PURITE

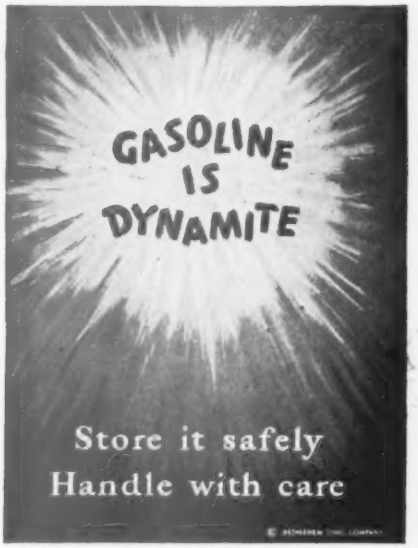
THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42nd STREET, NEW YORK 17, N. Y.
(Licensee of Metallurgical Development Company, Inc.)

In Canada: Railway & Power Engineering Corporation, Limited

COME ON ED— STOP DAY-DREAMING IN FRONT OF THAT POSTER
HOW TO USE A FIRE EXTINGUISHER
THIS IS NO DREAM IT'S GOOD STUFF TO KNOW
MOTORS THROWIN' SPARKS ...BETTER SHUT DOWN!
LOOK OUT, ED SHE'S ON FIRE!
THAT DAY-DREAM KIND OF PAID OFF ... HUH, BILL?

fighting fires with

POSTERS



Bethlehem has long had an efficient fire-fighting organization. But war conditions multiply normal fire hazards. Thousands of new employees have come to work. Large additions have been made to existing facilities, and entire new departments set up. At the same time, war needs have intensified the pressure for production.

Since the start of the war emergency Bethlehem has redoubled its effort to keep down production loss due to fires. Much new equipment has been provided: extinguishers, alarm boxes, sprinkler systems, hose outlets and fire engines. And as plants grew, fire-fighting personnel was expanded, and given special training.

BETHLEHEM STEEL

A poster campaign, of which a few representative samples are shown on this page, is one important detail of this program. Each poster registers in the employee's mind a single, specific point in fire-fighting or fire-prevention. Prominently displayed in steel plants, shipyards, fabricating shops, these posters are helping to maintain a favorable fire-loss record through the war years.

A fire on the production front can cost American lives on the battle-fronts. Even seemingly trivial fires have a grave cumulative effect. The aim is to prevent fires from occurring at all—and, if they do occur, to make them die young.

Without a Peer!

HERE'S WHY:

FAST—Green Bond is fast. It blends with sand so quickly that it's the ideal bentonite for use in today's high-speed mullers. Uniform grind makes it fast. For real speed, it's Federal Green Bond.

STRONG—Green Bond is strong. Careful selection and pre-testing of deposits—laboratory control of every processing step guarantees its strength when it reaches the foundry.

UNIFORM—You can establish your batch-mix with Green Bond permanently. Careful selection and processing by us ensure a constant, never-changing mix to you.

Help to Hasten Victory—Buy War Bonds!

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland, 5, Ohio

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • MINNEAPOLIS • NEW YORK • ST. LOUIS • RICHMOND, VA. • Mines UPTON, WYO.

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LeGrand Industrial Supply Co., Portland, Ore. • Shanahan's Ltd., Vancouver, B. C.

THE FOUNDRY

for MAY 1944

VOLUME 72 NUMBER 5

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a safe way to make

LINOIL

FOR MAGNESIUM

Yesterday only a handful of foundrymen the country over knew magnesium. Today the volume and perfection of these uncannily light tough castings is an outstanding miracle of America's war effort.

It is not strange that foundrymen groped blindly at first. Who wouldn't? For most, the new metal called for a completely new technique and an abrupt change about from all familiar foundry practice, and the demand was speed, speed, great production and great precision.

A big problem was the cores. They must be weak enough to collapse from low heat quickly dissipated,

Cores and castings for supercharger housing for "B-17" Bombers of the Army Air Force. Castings are 20″ in diameter with walls 3/32 inches thick: weight 26 pounds. Made by

THE WELLMAN BRONZE AND ALUMINUM CO.

CLEVELAND, OHIO

THE WERNER G.

(DIVISION OF ARCHER-

2191 WEST 110 STREET WOODBINE

magnesium castings

they must be strong enough to withstand large flow; and the cores in many cases were exceedingly intricate. This was up our alley and we solved it—we gave the magnesium makers Linoil "38".

Some large producers have used Linoil "38" two years, others for shorter periods, and all report gratifying results. The low baking heat of Linoil "38" allows the incorporation of inhibitors in the core sand mix and eliminates hit-or-miss spraying. With Linoil "38" the foundryman has his feet on the ground again and knows what he is doing. He knows that he is again playing safe—and with Linoil.

We have considerable data on magnesium work available to magnesium foundrymen. Write to Cleveland or telephone the nearest Linoil man.

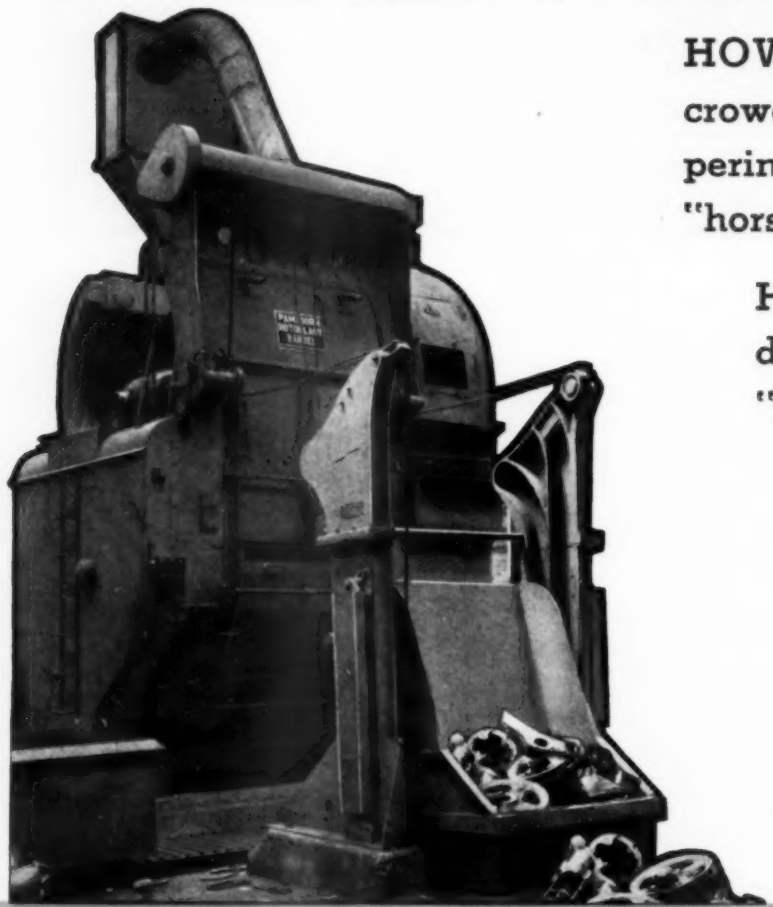
SMITH COMPANY

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO

Clean your castings

MORE LOADS—FASTER DELIVERY—FEWER DELAYS—GREATER PROFITS



HOW would "RUSH-HOUR" crowds get to work if subway superintendents still depended upon "horse-car" equipment?

How would war stimulated industry blast clean its daily "RUSH-HOUR" loads of castings and metal parts if it didn't depend upon machines like Pangborn Air Blast and ROTO-BLAST* Cleaning equipment?

ROTOBLAST* BARREL

*Trade mark

WORLD'S LARGEST MANUFACTURER OF BLAST

ARMY E NAVY

For excellence in production

PANG

PANGBORN CORPORATION . . . . . .

"RUSH-HOUR" schedule

CUTTING 50% OFF BLASTING TIME MEANS MANY MORE TONS OF WORK CLEANED DAILY

When you get castings to your cleaning room—75% of their total cost has been already spent in materials, labor and power. Why wait hours, days or weeks before you get your money back—due to "horse-car" cleaning methods?

Put your cleaning room on a "RUSH-HOUR" schedule by using modern Pangborn equipment to finish the job. Blast cleaning is your LAST OPERATION. Why delay it—when with PANGBORN you can get it out QUICKER—BETTER—and CHEAPER. COME TO PANGBORN for bulletins and information.

ROTOBLAST* TABLE

Pangborn Corporation for airless blast cleaning.

CLEANING AND DUST CONTROL EQUIPMENT

PANGBORN

ARMY E NAVY

For excellence in production

HAGERSTOWN, MARYLAND

THE NEW NO. 1—MODEL H

An Ideal Answer to the Mulling Problems of Many Foundries

OPERATING DETAILS

Capacity—4 to 5 cubic feet of properly prepared sand—without spillage.

Dust Enclosure—Completely encloses machine. Loading port can be rotated 360° on the crib to allow loading from any point.

Discharge—Rapid discharge through a new slide type, non-leak door.

Mullers—Two 300 lb. chilled car wheel iron mullers—anti-friction, sealed bearings. Mullers guaranteed against wear for five years.

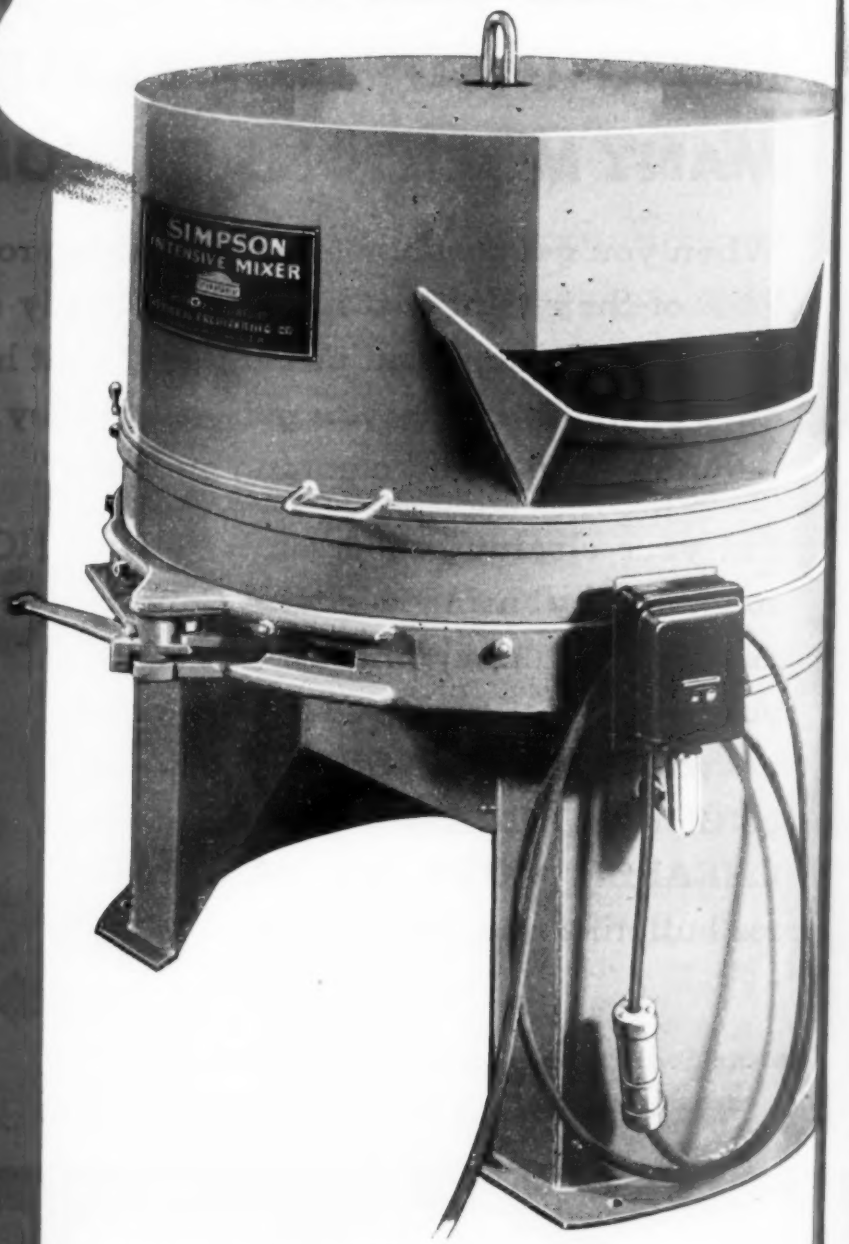
Wearplate—Carbon steel—perforated in all machines for use on either core or facing sand without change.

Drive—Unit Drive and built-in motor. Worm and helical gear reducer. 5 H.P. motor, ball bearing, totally enclosed, fan cooled. Starter on machine with extension cord. Standard equipment is 220 volt, 3 phase, 60 cycle, A.C.

Foundation—Completely enclosed base with discharge at proper height for wheelbarrow or molders boxes. Machine is complete unit—it can be moved into position and plugged in for immediate operation. Portable by crane or lift—fitted with a heavy crane lug.

Plows—Beaded with anti-abrasive "Neco" metal for long wear.

Safety Features—Built-in handy sand sampler. Totally enclosed to eliminate dust and give protection against all moving parts.



• New No. 1—Model H Simpson Mixer—portable, completely enclosed—designed for floor loading. Starter mounted on machine—discharge door of slide-type allows quick discharge into wheelbarrow without leakage.

PORTABLE SIMPSON INTENSIVE MIXER

★ Another Simpson Mixer takes its place in the National line. It is designed to solve the specific mulling problems of a broad range of foundries whose requirements demand top operating efficiency, medium capacity, economy and versatility. National Engineering has combined these features in the New No. 1—Model H Portable. Built upon the basic and successful Simpson Mixer Principles, it is a completely modern machine with dust enclosure, integral unit drive and motor, and is designed for floor loading. Being portable it is ideal for special as well as standard operations for side floor, core room or general molding.

Study the details shown at the left and then ask a National Engineer to give you the complete facts on the New No. 1—Model H Portable Simpson Intensive Mixer. Perhaps you will find it can help you to better, faster mixing—at lower cost.

• Above: Loading port is part of dust enclosure—affords protection from dust and moving parts. Hood rotates 360° for loading at any convenient point.

• Above: Rapid discharge is a feature of the New No. 1—Model H Simpson. Note operator need not hold door for discharge but is free to prepare next batch.

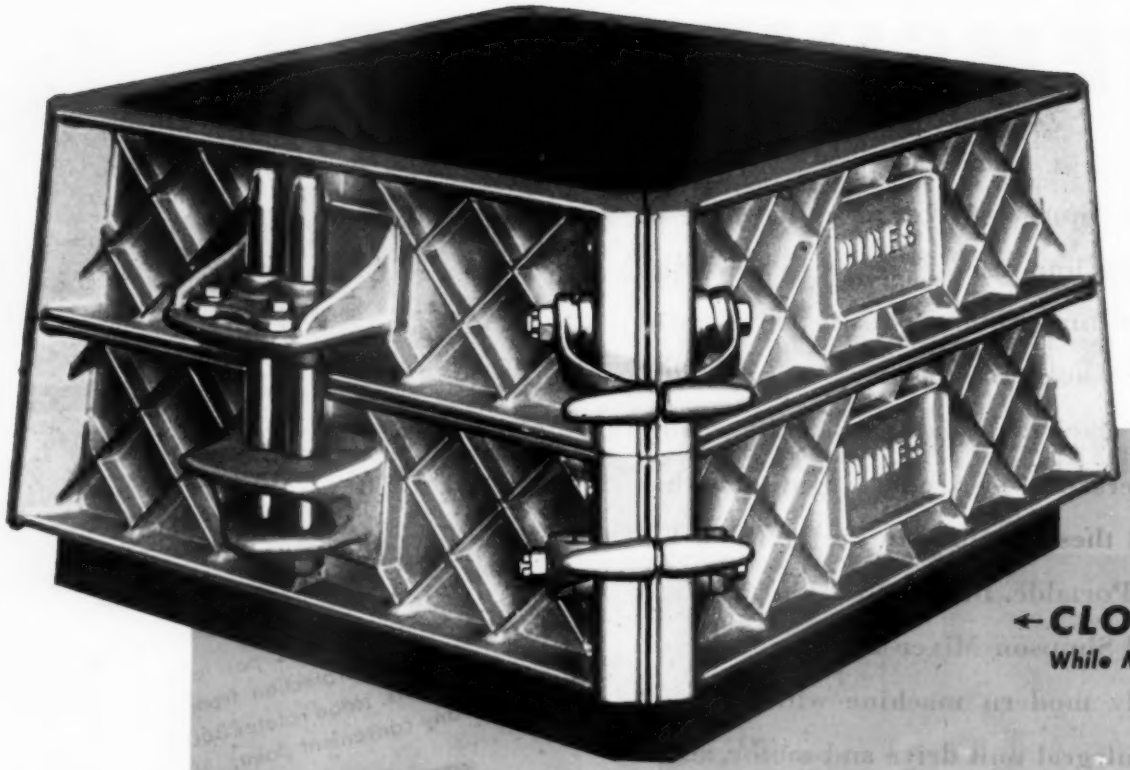
National Engineering Service **National Field Service**

For more than 30 years National Engineering and Field Service, has helped hundreds of foundries solve problems in sand preparation, reclamation, handling, storage and control. Today, National Engineers are constantly on the job helping foundries with problems of sand handling and control on construction, maintenance, repair or new requirements. National Engineering and Field Service is available and eager to help you whenever and wherever you need it.

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co.. Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia



←CLOSED
While Molding

ANOTHER

HINES "Pop-Off" FLASK

Trademark Reg. U. S. Pat. Off.

SERRATIONS on inside of Flask: Eliminate Sand Strips —Prevent Cope from Sagging and Drag from Dropping Down—Vent the Mold Perfectly—Give More Bearing and a Tight Joint at the Parting Line. Other Hines features include Double Round and "V" Pins, 4° Taper, and Filled-in Corners to insure a clean flask.

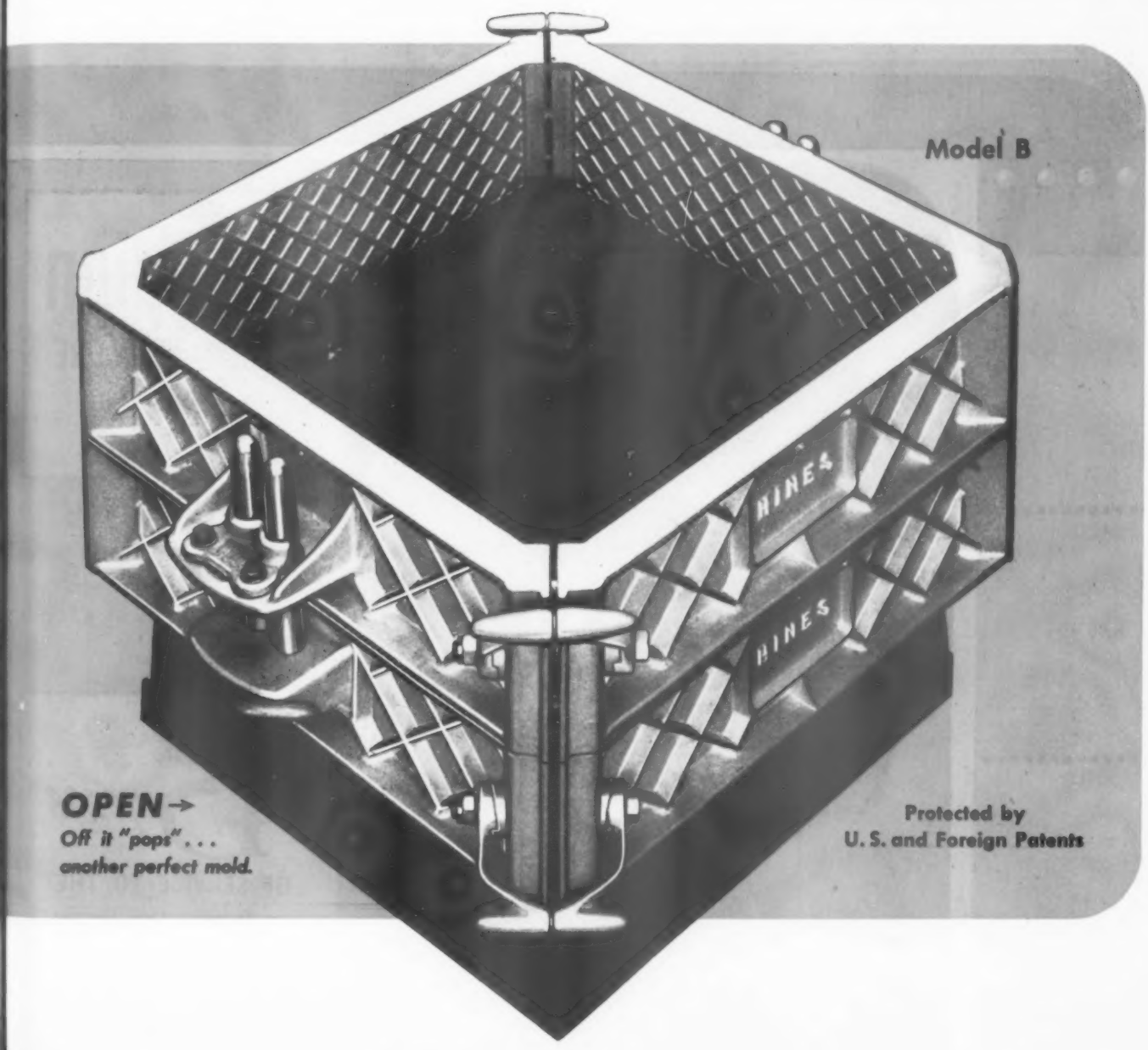
Exclusive Manufacturers of Flasks and Jackets for Over 25 Years

HINES
POP-OFF
(Trademark Reg. U. S. Pat. Off.)
FLASK

THE HINES

1324 HIRD AVENUE

LIGHT WEIGHT AND DURABLE



FLASK CO.

CLEVELAND 7, OHIO

A long line of great

Champion
MOLDING and CORE MACHINES

45 years
OF SERVICE TO THE FOUNDRY INDUSTRY

Every Champion installation is guaranteed to do the job you expect, exactly as you plan it.

CHAMPIONS

CHAMPION
CHAMPION
CHAMPION
CHAMPION
CHAMPION Foundry & Machine Company

MR. FOUNDRYMAN:

You get more good castings

WITH BONDITE—BECAUSE—

FIRST:

BONDITE is superior... A dry type foundry core and facing binder of hydrocarbon base—lighter in weight—cuts drying time 25% over oils.

SECOND:

BONDITE causes less deterioration of sand... On ignition, BONDITE produces a carbon-type volatile that covers all surface sand grains—forms a protective coating against metal action—prolongs the life of any silica sand.

THIRD:

BONDITE skin drys easily and will withstand greater torch heat without crumbling edges—eliminating oven drying.

FOURTH:

BONDITE, used with Bentonite or Cereal Binders, makes a very inexpensive mix. One Mid-west foundry saved 80% on core and facing costs and produced better castings.

BONDITE'S superiority can be readily established—easily proven. Developed to meet individual foundry conditions, the proper use of BONDITE will save binder and new sand expense—will produce cleaner, smoother castings, will reduce scrap and will increase production in steel, iron and brass.

BONDITE is available for immediate delivery. Write, wire or phone for full information.

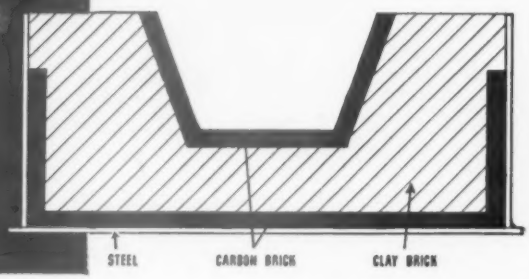
Bondite Corporation

2325 EAST 38TH STREET, LOS ANGELES 11, CALIFORNIA

844 150TH STREET, HAMMOND, INDIANA

6 months' service!

. . . for Carbon run-out troughs



CARBON LINED run-out troughs for blast furnaces are now giving six months of continuous service . . . instead of only a day or so for those of conventional construction.

Built up with carbon brick as shown in the cross-section sketch, the necessity for routine—and hazardous—rebuilding of the lining is eliminated. A stream of cold water on the hot iron fractures the metal for immediate removal and cleaning of the trough . . . with no harm to the carbon brick from thermal shock.

The reasons for the excellent service of run-out troughs built with "National" carbon brick are important. It is to your advantage to know them. For carbon and graphite are the ideal materials for many metallurgical applications such as furnace linings, mold plugs, stools, molds, and others. These reasons are:

- **Carbon retains its mechanical strength well past the highest temperatures attained in handling molten metals.**
- **Carbon is subject to no deformation under the pressures normally encountered at these temperatures.**
- **Carbon is unaffected by rapid and violent changes in temperature, for example: from 3300° F. to 0° F.**

"National" carbon and graphite have other important properties . . . and there are other applications . . . that greatly improve steel making and foundry practice and economy. Our offices are conveniently near and we cordially invite your inquiries. Also, write for our Catalog Section M-8000 "Industrial Applications," National Carbon Company, Inc., Cleveland 1, Ohio, Dept. 37E.

★ *BUY UNITED STATES WAR BONDS* ★

The word "National" is a registered trade-mark of National Carbon Company, Inc.

NATIONAL CARBON COMPANY, INC.

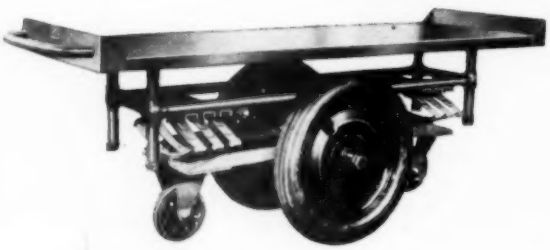
Unit of Union Carbide and Carbon Corporation

CARBON PRODUCTS DIVISION, Cleveland 1, Ohio UCC New York, Pittsburgh, Chicago, San Francisco

Modernize Core Handling With
CMD PNEUMATIC CORE TRUCKS

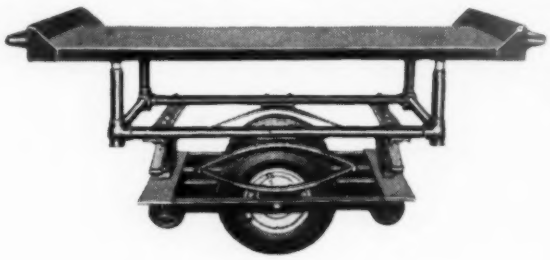
Only CMD Pneumatic Core Trucks offer this patented inner coil spring construction in upright supports. It assures full resiliency even under light loads.

It has always been good business to minimize core damage by carrying cores in CMD Pneumatic Core Trucks. Now, with a manpower shortage, it is more important than ever to use this time-saving equipment. CMD Pneumatic Core Trucks are reducing handling costs from 50 to 75 per cent in leading war plants. Their exclusive *inner coil spring* in the upright supports, and pneumatic tires, provide maximum resilience for full protection against breakage. Write for 4-page folder on CMD Core Trucks and other foundry specialties.



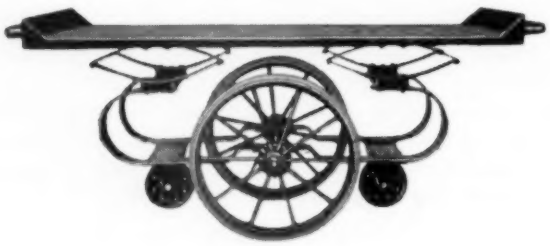
TYPE A-27

This giant carrier can carry loads up to 1400 lbs., yet is amazingly "gentle" in protecting cores against chafing and breakage. It has 4-ply pneumatic tires, sturdy elliptical springs and the famous CMD coil spring in each of the four upright supports. Made in 3 sizes: 27" x 60", 27" x 72", and 27" x 84".



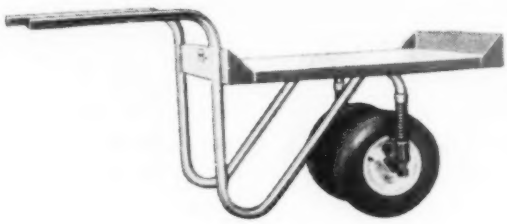
MODEL A-27-J

Pneumatic tires and a combination of coil springs and elliptical springs (in the upright supports) give this medium capacity truck ample resilience to protect cores from damage. Loading tray is 27 inches wide by 60 inches long and is made of heavy sheet steel, well reinforced. Load capacity, 600 lbs.



RESILIENT CHASSIS TYPE B-1

Where utmost resilience is of prime importance, this truck with its specially heat-treated spring-steel chassis and intermediate elliptical springs just below the loading tray is first choice of experienced foundrymen. Your choice of pneumatic tires or solid rubber tires. Load capacity, 700 lbs.



CMD PNEUMATIC CORE BARROWS

Available with single wheel or two wheels, these light, easy-to-handle barrows simplify safe handling of cores in "hard-to-get-into" places around your foundry. Loading surface 24" x 40".

Manufacturers of a complete line of core-conveying equipment and other foundry specialties

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. 5F, 1928 West 46th St. CMD **• • Chicago 9, Illinois • •**

MACKLIN
GRINDING WHEELS

FOUNDRIES, large and small, require grinding wheels in many sizes, shape, grains and grade combinations.

Macklin Company is thoroughly equipped to produce high quality grinding wheels for all foundry requirements.

No matter what your grinding problems may be there is a Macklin wheel to fit the job that will "Protect Your Production."

Ask for the services of a Macklin Field Engineer.

Invest in War Bonds

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

***Sales Offices:*—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia**

I KNOW IT'S BAKED RIGHT!
It came from our Despatch Ovens!

Foundrymen who work with core ovens get to know them well. So when *they* say a Despatch oven is okay, it's straight stuff; they're not kidding!

Here are some reasons why practical foundrymen throughout America are *sold* on Despatch foundry ovens, and why your next oven should be Despatch-Built.

6 Reasons Why Foundrymen Like These Ovens

SPEEDY BAKING with unique high volume airflow system.

EASY LOADING systems to fit any foundry layout.

SAVES SPACE with streamlined, compact design.

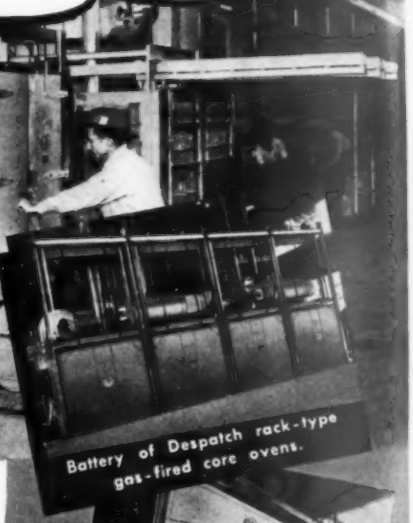
UNIFORM HEAT to assure even baking of every core.

LOW FUEL COST with very high-efficiency heating.

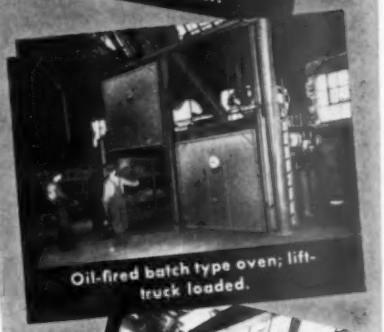
AUTOMATIC control of heat; needs no watching.

ASK for your free copies of new, informative foundry bulletins mentioned below. Very complete, fully illustrated.

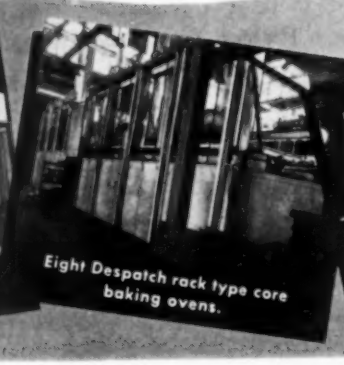
DESPATCH
OVEN COMPANY MINNEAPOLIS


Battery of Despatch rack-type gas-fired core ovens.

Large car-type Despatch oven. Manual lift door.


Oil-fired batch type oven; lift-truck loaded.

Intermittent conveyor oven. Has 40 ft. chamber.


Eight Despatch rack type core baking ovens.

Despatch gas-fired oven; easy-loading rack model.

Car type Despatch oven for baking heavy cores.

The

INGOT of Tomorrow

FOR YOUR USE TODAY!

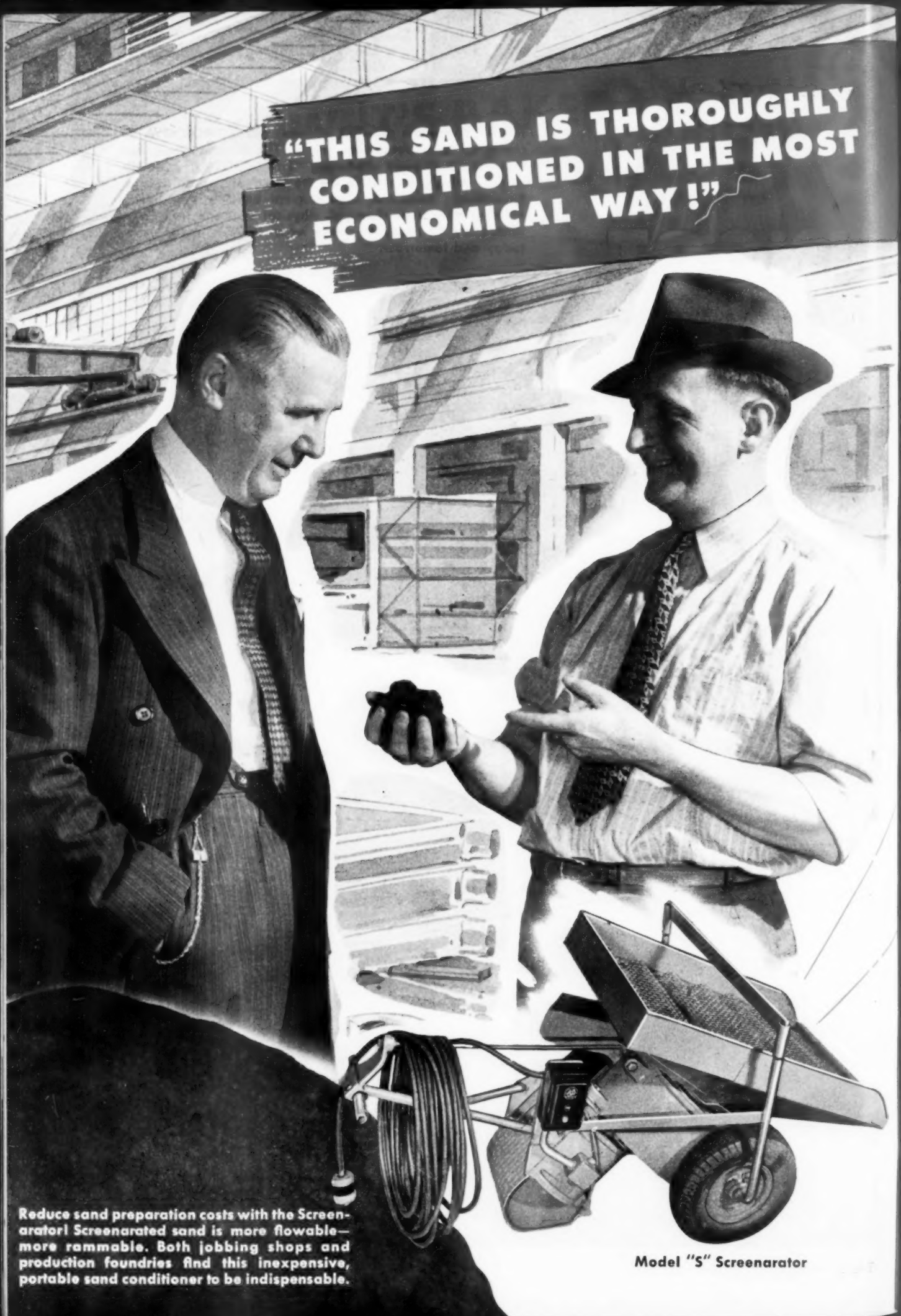
TODAY'S modern miracles of war will TOMORROW be converted to a peace-time world. The Samuel Greenfield Co., Inc., is already producing "THE INGOT OF TOMORROW"—an ingot made to the most exacting specifications. Greenfield's complete, metallurgical control department, utilizing a modern chemical, physical and spectrographic laboratory is ready to serve your INGOT needs . . . today and tomorrow.

INGOT QUOTATIONS ON REQUEST

Samuel Greenfield Co., Inc.

MANUFACTURERS OF BRASS, BRONZE AND ALUMINUM INGOTS

31 Stone Street **HUmboldt 4050** **Buffalo 12, N. Y.**



Reduce sand preparation costs with the Screenarator! Screenarated sand is more flowable—more rammable. Both jobbing shops and production foundries find this inexpensive, portable sand conditioner to be indispensable.

Model "S" Screenarator

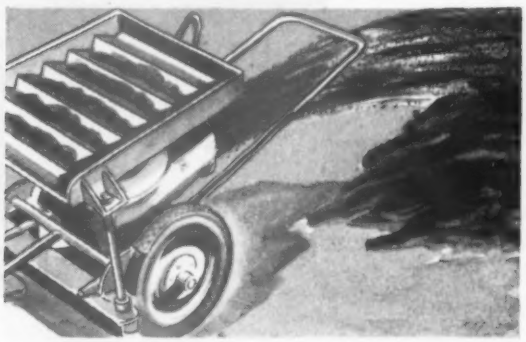
The Screenarator

SCREENS, DOUBLE AERATES AND PILES!

1 Operator easily moves Screenarator to desired position from floor to floor.

2 Electrically operated, the Screenarator plugs into an available power outlet.

3 Convenient height and angle of screen makes shovelling easy. Sand goes on screen . . . tailings roll off . . . lumps are cut and broken . . . sand is blended and thoroughly aerated.



4 Conditioned sand is discharged as far as 25 feet . . . elevated 2 to 10 feet (receiving a second aeration) and piled wherever desired. It is now extremely flowable and rammable, ready for immediate use.

Get this interesting Monthly Foundrymen's Magazine . . . Free! Write for it now!

Produce better finish on castings . . . yet meet competitive prices! The B & P Screenarator assures an ample supply of *good* sand prepared at extremely low cost. *Write today for complete information on the Screenarator!*

THE BEARDSLEY & PIPER COMPANY

2541 North Keeler Avenue, Chicago 39, Illinois

THE BEARDSLEY & PIPER COMPANY ARE MANUFACTURERS OF SPEEDSLINGERS, SPEEDMULLORS, SANDSLINGERS, SCREENARATORS, SHAKE-OUTS, SAND CONDITIONING MACHINES, GYRATORY SCREENS

Where would YOU Choose to Work if you were a molder?

Logically you would be attracted to the foundry with the best working conditions, since hourly rates, transportation and other factors would be pretty much the same.

Of course, *the best working conditions imply* modern effective dust and fume control as provided by the Schneible Multi-Wash System—not just a dust collector but a proved method of washing foundry air to remove float dust, fumes and odors.

Besides its effectiveness, vouched for by scores of foundry users, the Schneible offers several unique advantages: collected dust is converted to sludge; no dry dust to dispose of. There are no bags, screens or filters to shake, clean or become clogged—nothing to replace, burn or wear out—no dependence on "the human element."

Present-day operations favor plant modernization—foresight suggests plant improvements today so as to be in a position to meet the competitive demands of tomorrow.

Send for bulletin picturing typical grey iron, steel and nonferrous foundry installations.

CLAUDE B. SCHNEIBLE CO. Detroit (16), Michigan

2827 Twenty-Fifth Street

Four Schneible 20,000 c.f.m. Multi-Wash Dust and Fume Collectors at large production foundry making tractor parts. (Two additional units were installed since picture was made.)

SCHNEIBLE

DUST, ODOR AND FUME CONTROL EQUIPMENT

An Important Aluminum Alloy Source for Your Ingot Requirements

BUY WAR BONDS ★

DEVOTING our entire plant facilities, as we do, to the production of Aluminum Alloy Ingot, we are in position to supply your every requirement and to meet your most exacting specifications. More than a quarter century of accumulated experience in the making of Aluminum Alloy Ingot is available to you at Aluminum Refiners.

Aluminum Refiners

Division of

BOHN ALUMINUM & BRASS CORPORATION • Detroit 26, Michigan

General Offices Lafayette Building

MANUFACTURERS OF ALL TYPES AND SHAPES OF CASTING AND DEOXIDIZING ALLOYS

. . . With the Aid of Magnaflux* Indications

MAGNAFLUX RESEARCH

Since the pioneering stage of the original Magnaflux Method for steel, our engineers have sought to extend the benefits of rapid non-destructive inspection techniques in every field. For the important foundry industry special portable equipment and new procedures for more sensitive results were developed.

• Any workman, foreman or executive could have been forgiven in the old days for allowing this gray cast iron generator housing to leave the foundry. Yet, on inspection by the Magnaflux* Method a large shrinkage crack shows up clearly. The part is defective, plainly marked for trouble —later—when the whole generator must be torn down.

The business advantage of being able to spot sub-standard parts and trace their causes is enormous. With Magnaflux every piece and part can be examined in the foundry for shrinkage cracks, porosity, blow-holes, scabs and surface cracks. Surface indications are obtained which indicate all surface and many sub-surface flaws.

For the more competitive business weather which lies ahead, it's a sound move, now, to look into the possibilities of Magnaflux in your business. Just write us that we may send an explanatory bulletin.

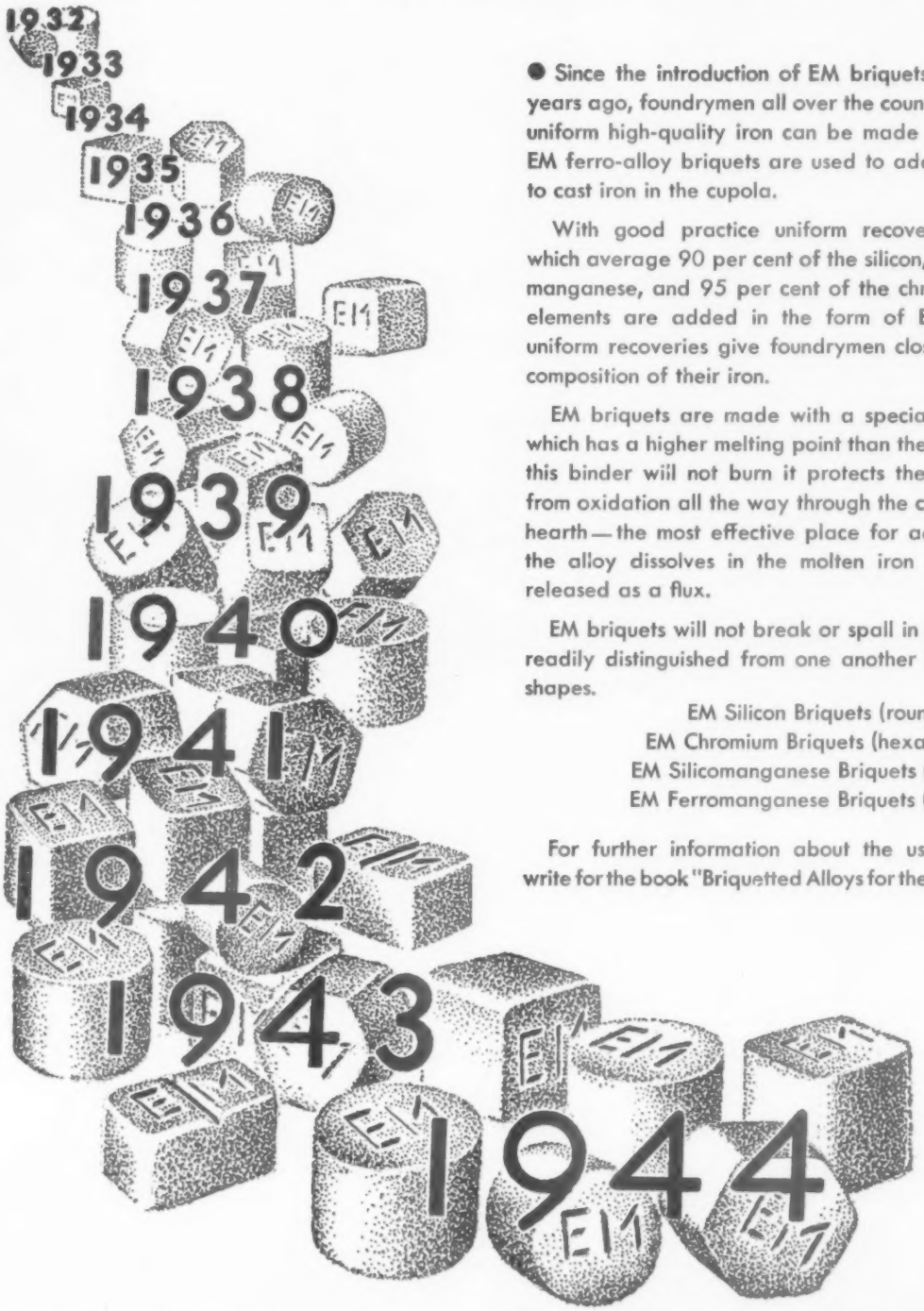
*Magnaflux—the Trade Mark of the Magnaflux Corporation applied to its equipment, materials and methods for magnetic particle inspection.

MAGNAFLUX CORPORATION

5918 Northwest Highway, Chicago 31, Illinois

New York • Detroit • Dallas • Los Angeles • Cleveland • Birmingham

12 YEARS of Successful Service Prove the Merit of EM Briquets



● Since the introduction of EM briquets more than twelve years ago, foundrymen all over the country have found that uniform high-quality iron can be made economically when EM ferro-alloy briquets are used to add alloying elements to cast iron in the cupola.

With good practice uniform recoveries are obtained which average 90 per cent of the silicon, 85 per cent of the manganese, and 95 per cent of the chromium, when these elements are added in the form of EM briquets. These uniform recoveries give foundrymen close control over the composition of their iron.

EM briquets are made with a special binding material which has a higher melting point than the ferro-alloys. Since this binder will not burn it protects the alloying elements from oxidation all the way through the cupola. When in the hearth — the most effective place for adding the alloys — the alloy dissolves in the molten iron and the binder is released as a flux.

EM briquets will not break or spall in handling. They are readily distinguished from one another by their distinctive shapes.

EM Silicon Briquets (round)
EM Chromium Briquets (hexagonal)
EM Silicomanganese Briquets (square)
EM Ferromanganese Briquets (oblong)

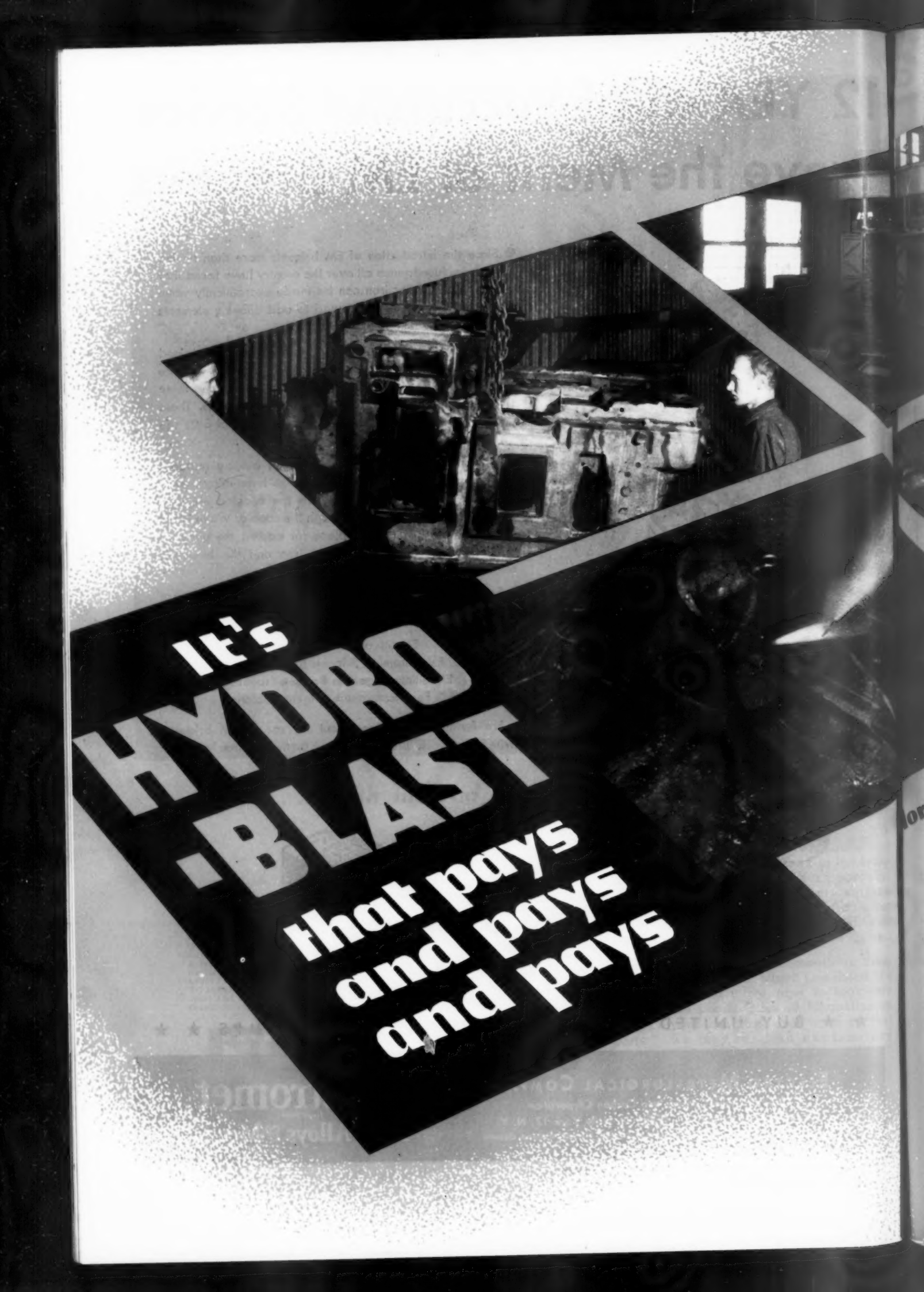
For further information about the use of EM Briquets, write for the book "Briquetted Alloys for the Cast Iron Foundry."

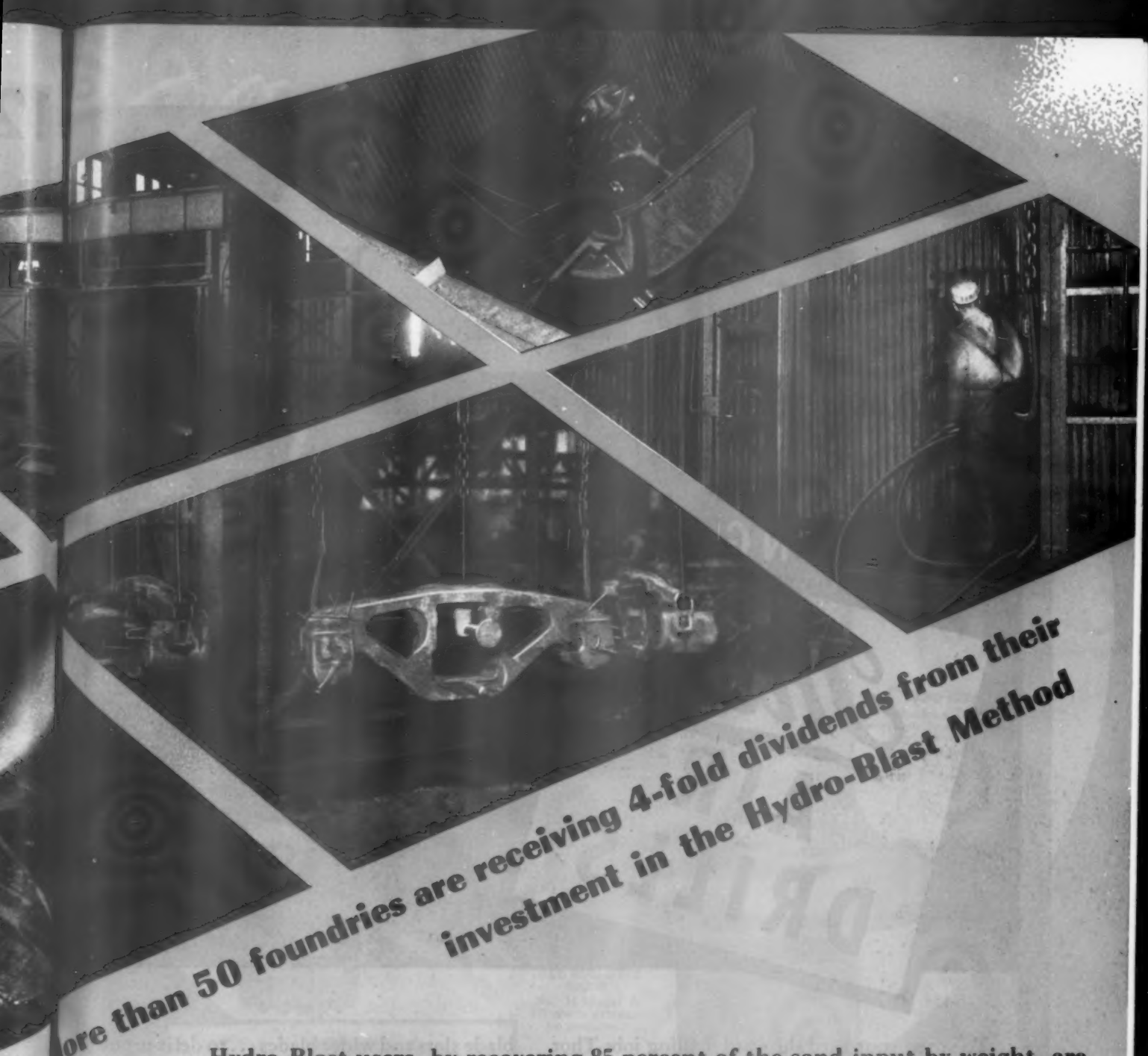
★ ★ BUY UNITED STATES WAR BONDS AND STAMPS ★ ★

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet Trade Mark
Ferro-Alloys & Metals

"EM" is a registered trade-mark of Electro Metallurgical Company


It's
HYDRO
-BLAST
that pays
and pays
and pays



ore than 50 foundries are receiving 4-fold dividends from their investment in the Hydro-Blast Method

Hydro-Blast users, by recovering 85 percent of the sand input by weight, are reducing their former freight car, barge and dump truck requirements by more than 75 percent. The recovery of the formerly wasted sand at less than 75 cents per ton, including labor, power, water and maintenance, more than pays for the Hydro-Blast Method during the first year of operation and releases many millions of transport ton miles for greatly needed war materials. Two unskilled laborers and a Hydro-Blast clean the castings better and knock out cores faster than ten chippers. Hydro-Blast mines out the hardest and most complex cores, performs the former chipping operations, cleans surfaces to microscopic cleanliness, and recovers waste sand—all without the creation of dust.

Now is the time to bring your casting cleaning and sand recovery operations up-to-date. Hydro-Blast engineers are available for discussion of today's war production and tomorrow's competition.

THE HYDRO-BLAST CORPORATION

2550 N. WESTERN AVE., CHICAGO, ILL.

Smooth POWER

FOR FAST, ACCURATE DRILLING

Thor AIR DRILLS

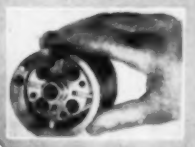
To speed your hard shipyard drilling jobs Thor Air Drills have *power* and plenty of it. It's *smooth* power, too, the smooth power that makes drilling highly accurate and precise . . . that gets the job done *right* as well as fast.

You get that smooth power with Thor Air Drills because Thor's compact, one-piece construction of rotor and shaft provides deeper blade slots and wider blades . . . to deliver power in a steady, even flow.

What's more, aluminum cylinders and malleable iron housings reduce both the size and weight of Thor drills. And they have a speed governor that controls and *minimizes* air consumption . . . automatic lubrication . . . heavy duty bearings . . . and triple gearing for greater torque reserve.

For helpful information on the complete line of Thor Air Tools for the shipyard, send for Thor catalog 52B.

WHY YOU GET *Smooth* POWER WITH *Thor* AIR DRILLS



Thor's one-piece construction of rotor and shaft, shown here, provides deeper blade slots and wider blades to give a *smooth* flow of power for faster, more accurate drilling.

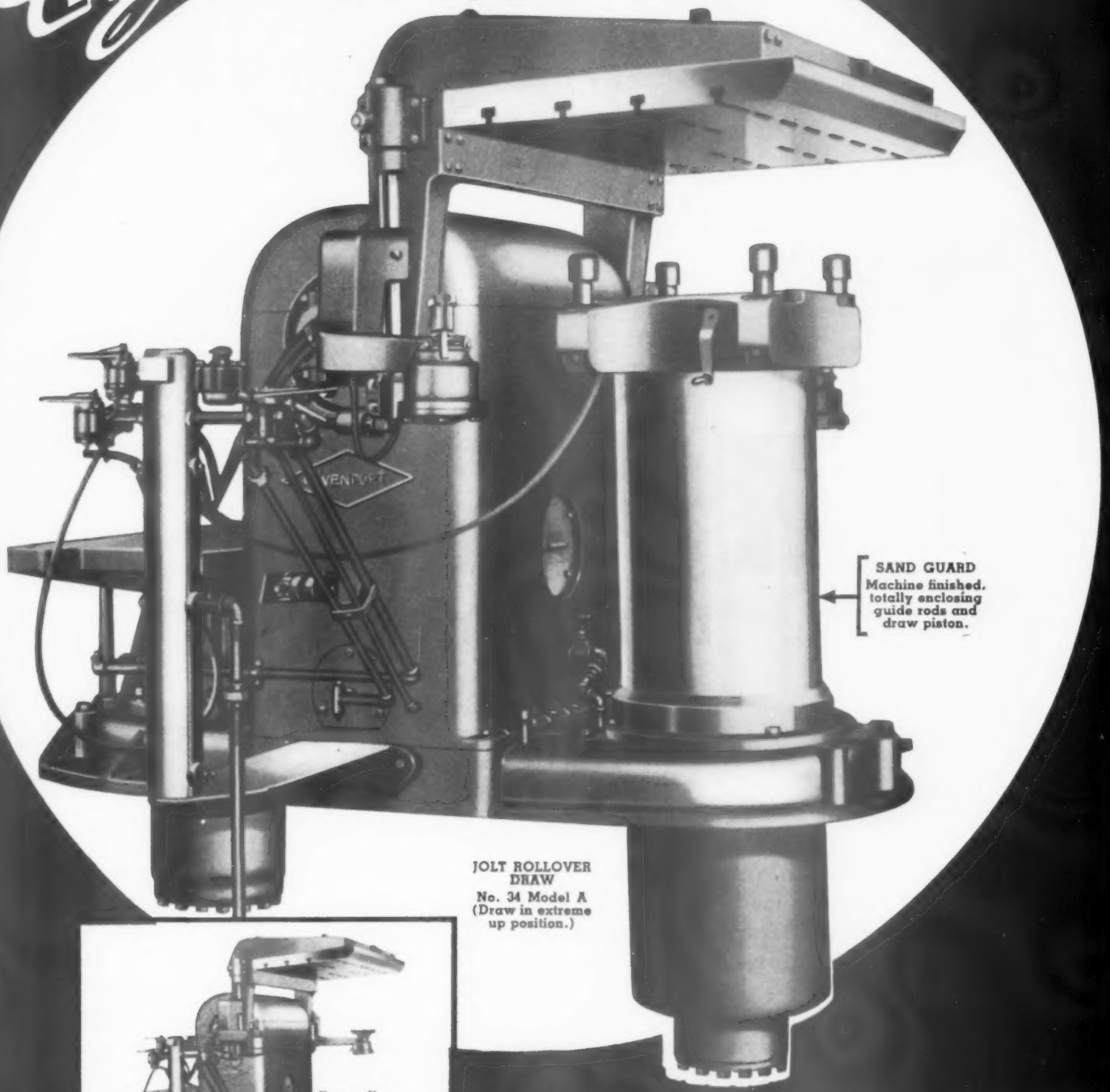
Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

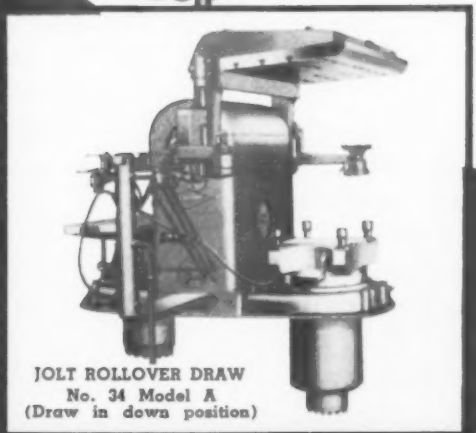
Branches in Principal Cities

Adjustable Draw



SAND GUARD
Machine finished, totally enclosing guide rods and draw piston.

JOLT ROLLOVER DRAW
No. 34 Model A
(Draw in extreme up position.)



JOLT ROLLOVER DRAW
No. 34 Model A
(Draw in down position)

FOR BETTER CORES

HOUGHTON'S

HY-TEN

CORE BINDERS

OIL TYPE

New DRY TYPE

. . . Oils that enable increased oven production. Cores made with Hy-Ten will permit faster baking without harming surfaces, these sections or sharp edges.

. . . Oils that evolve less gas.

. . . Oils that are polymerized—not air-drying. Mixes do not encrust.

. . . Oils that are uniform—made under strict laboratory control.

New low-bake oils, too, that save fuel and permit using volatile inhibitors in core mix.

Dry core binders represent a new concept in the science of core making.

Types are offered for non-ferrous and for grey iron or steel casting. Each has its merits, including reduced baking time, high hot strength, minimum gassing and easy clean-out.

For complete data on Hy-Ten Dry Core Binders, call in the Houghton Man, or write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Penna.

HOUGHTON FOUNDRY RESEARCH HELPS

America's Core Rooms

DO JAPS BELIEVE IN GHOSTS ?

Japs certainly will believe in ghosts when they see the battleship, Oklahoma, which they sank at Pearl Harbor, come back to continue the fight against them. For although Jap bombs found their mark and the Oklahoma sank to the bottom, she didn't stay there. American ingenuity has raised her and is now rebuilding and modernizing her to go back and finish the fight.

And just as the Oklahoma was recovered and lives to fight again . . . so aluminum scrap and scrap from aluminum alloys may be re-converted and live to fight again. The aluminum in planes, tanks and ships that have seemingly been destroyed can be re-alloyed into new aluminum alloys that meet rigid specifications for quality and strength. These alloys, like the Oklahoma, need not be "Lost In Action" but may be salvaged and live to fight again.

BUY BONDS

Aluminum and Magnesium, Inc.
Sandusky, Ohio

The American Metal Company, Limited
New York City

Apex Smelting Co.
Chicago, Illinois

The Cleveland Electro Metals Co.
Cleveland, Ohio

Federated Metals Division American Smelting and Refining Company
New York City and Branches

General Smelting Company
Philadelphia, Pennsylvania

Samuel Greenfield Co., Inc.
Buffalo, New York

William F. Jobbins, Inc.
Aurora, Illinois

R. Lavin & Sons, Inc.
Chicago, Illinois

The National Smelting Company
Cleveland, Ohio

Niagara Falls Smelting & Refining Corp.
Buffalo, New York

Sonken-Galamba Corporation
Kansas City, Kansas

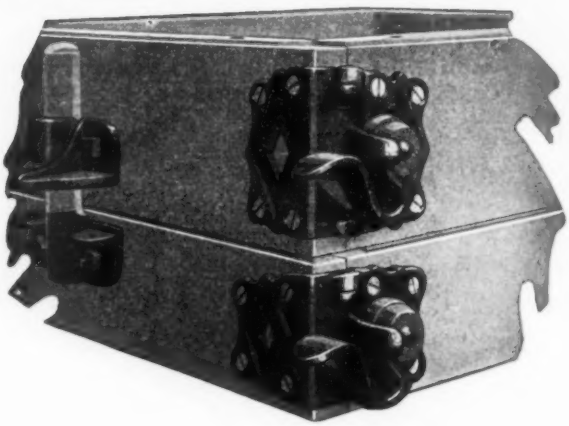
U. S. Reduction Co., *East Chicago, Indiana*

ALUMINUM RESEARCH INSTITUTE

111 West Washington Street, Chicago 2, Illinois

A *Real* INVESTMENT FOR MORE PRODUCTION!

DIAMOND FLASKS



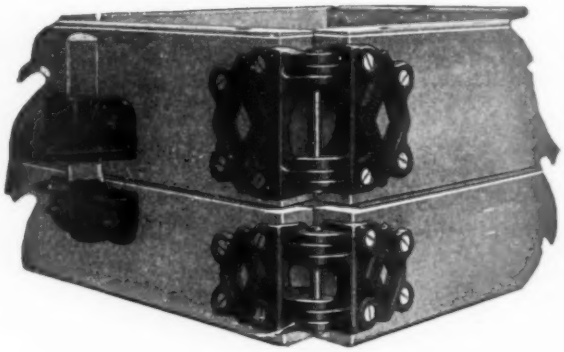
No matter what happens—you'll never be wrong if you equip for production with *good* flasks. Because we can give you many exclusive features in a flask developed over a period of 50 years, it can also be said that, "You can't go wrong on a Diamond," either. Note these important features:

- **A SUPERIOR LATCH (exclusive)**

  It's self-compensating for wear. The tighter you draw it, the firmer the grip. Has special cam which is easily adjustable as extreme wear on parts develops. Only *Diamond* has this patented feature.

- **PRECISION-MADE**

  Made from the finest grade of well-seasoned cherry stock, all flasks are made to precise measurements according to your specifications.



- **A PATENTED HINGE (exclusive)**

  Note the construction of Diamond hinges. The lugs are carefully milled and are interlocking which eliminates "play" no matter how long or how hard the flask is used.

- **SPECIAL SHAPES**

  We regularly supply customers with special shape flasks, including round flasks, and special cut partings.

STEEL JACKETS

Made from Nos. 7 to 10 gauge steel, true to size and taper. Are practically indestructible, and retain their shape under severest conditions. Thousands of these jackets in use.

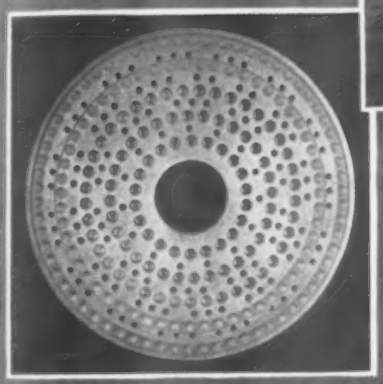
DIAMOND

CLAMP AND FLASK COMPANY

Telephone 2553 **Richmond, Indiana**

Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889

Properly Conditioned Sand for Nonferrous Castings



In one of the three nonferrous foundries of the Oscar W. Hedstrom Corporation, Chicago, currently producing aluminum, bronze and brass castings for armament exclusively, the Royer Sand Separators and Blenders pictured are at work. This company is widely known for its "OH38" castings, a secondary aluminum alloy with remarkable properties which have proved their value in both war and peace-time applications.

Properly conditioned sand is highly essential for nonferrous armament castings, especially "OH38". All production at the Hedstrom foundries is under close laboratory control, but the sand control problem has been disposed of by the installation of Royers.

Only a Royer provides the Six Point Sand Conditioning indispensable to correct facing, backing and core sands: (1) thorough refuse removal; (2) positive lump breaking; (3) complete blending and mixing; (4) even distribution of moisture; (5) increased permeability; (6) double aeration. All this is accomplished with a minimum of manpower.

Over 5,500 Royers are in service today. Users include the nation's outstanding ferrous and nonferrous jobbing and production foundries. There's a model and size for every foundry requirement. Royers are sold only by factory trained engineers, with long experience in sand conditioning and molding problems. Their job is to help you increase production and cut sand conditioning costs. Call a Royer engineer first!

Write for full information, including operating economies.

THE TURTLE KNOWS HER SAND!

By instinct she selects hot, dry sand to lay her eggs where the warmth will aid incubation, and sufficiently above high tide so that the water will not reach them.

Molders know sand must not be too hot and dry and not too wet; well aerated, blended and free of contamination. Only a Royer provides all of the essential "6 points" of thoroughly conditioned sand.

THE ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

FOREMOST IN SAND CONDITIONING EQUIPMENT

MOLDING *the* MANPOWER SITUATION

PARASPRAY

Releases 72 Men per 1000 Airplane Cylinder Heads for other essential duties

PARASET

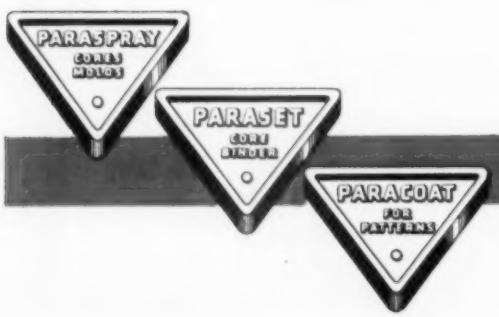
A unique core binder of cement containing rubber. Makes a strong core which gives off little gas, cutting porosity and gas holes to minimum.

PARACOAT

Pattern finish. Completely resists action of water, oil, acid or other elements used in core mold mixes. Dries quickly . . . longer life. Does not become "tacky" or sticky.

Read what one leading founder of vital airplane cylinder heads has to say:

"Our experience shows that we save 72 men and $1.182 per head on every 1000 heads cast." Other Founders declare that welds in Rocker Arms have dropped to less than 2% and another testifies that Paraspray . . . Paraset and Paracoat effect an 8% saving in core-making.



Sole licensees under the Saeger Patents exclusively regulating the use of rubber compounds in making and spraying cores and molds.

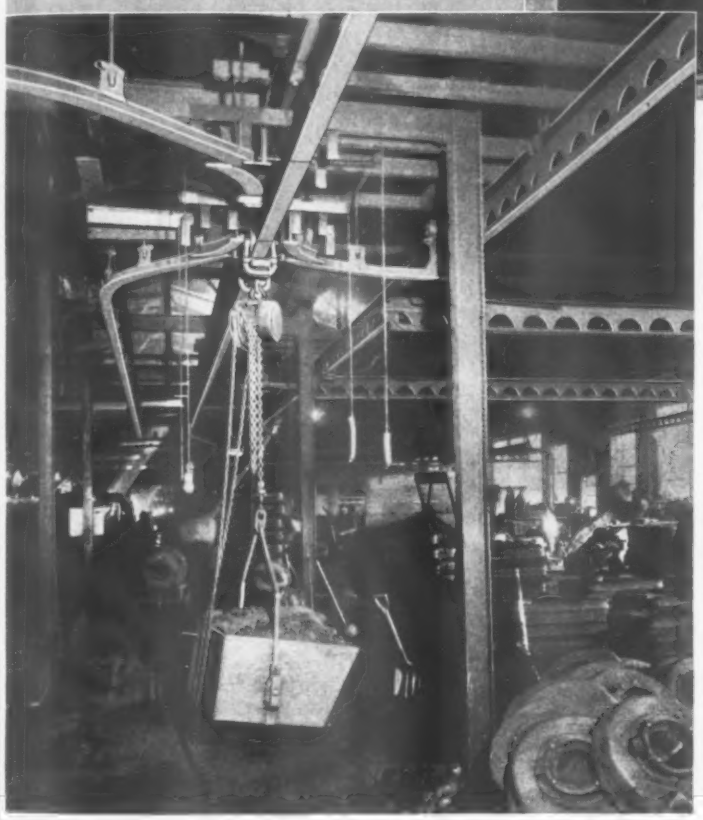
FOUNDRY RUBBER COMPOUNDS CORP.

1050 30th Street, N. W. Washington 7, D. C.

COPY'T 1943 — FRCC

TERRE HAUTE MALLEABLE FOUNDRY EQUIPPED THROUGHOUT WITH CLEVELAND TRAMRAIL

Right: Sand Facing Department. Old sand is conveyed here from the pouring floor on the overhead tramrail system and reworked in the sand mullers.



Seven transfer bridges (see archbeam bridges in right side of picture) serve the pouring floor. These are used for handling large molds from molding machines to the floor, for pouring, and for shaking out the castings.

Because the bridges connect with rail spurs of the track system, buckets of old sand can be transported directly to the Sand Facing Department on easy rolling carriers without rehandling.

A major factor in attaining the high rate of efficiency at the Terre Haute Malleable & Mfg. Corp., Terre Haute, Indiana, is the Cleveland Tramrail System which extends through the various departments. Not only does the system permit bringing the hot metal from the furnaces to the pouring floors in quick time, but it also is of great help in expediting the production of molds, handling sand to and from the mullers, and transporting castings.

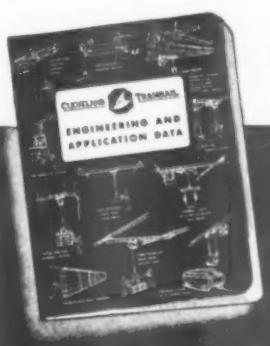
Many years ago, Terre Haute officials recognized the possibilities of transporting materials on overhead trackage and installed a limited amount of light equipment. This experience led to the discovery of one point of great importance: Materials handling equipment for foundry work must be heavily constructed to withstand the rigors of the service.

When an extensive overhead system was decided upon, the lighter equipment actually was discarded and Cleveland Tramrail installed throughout. Since the Cleveland Tramrail equipment was first erected in 1936 it has been in continuous operation. It has required practically no maintenance and no one can recall of it ever being "down."

Foundries of every type are profiting through use of Cleveland Tramrail. Now is the time for you to consider its possibilities.

★

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1155 EAST 283RD ST. WICKLIFFE, OHIO.



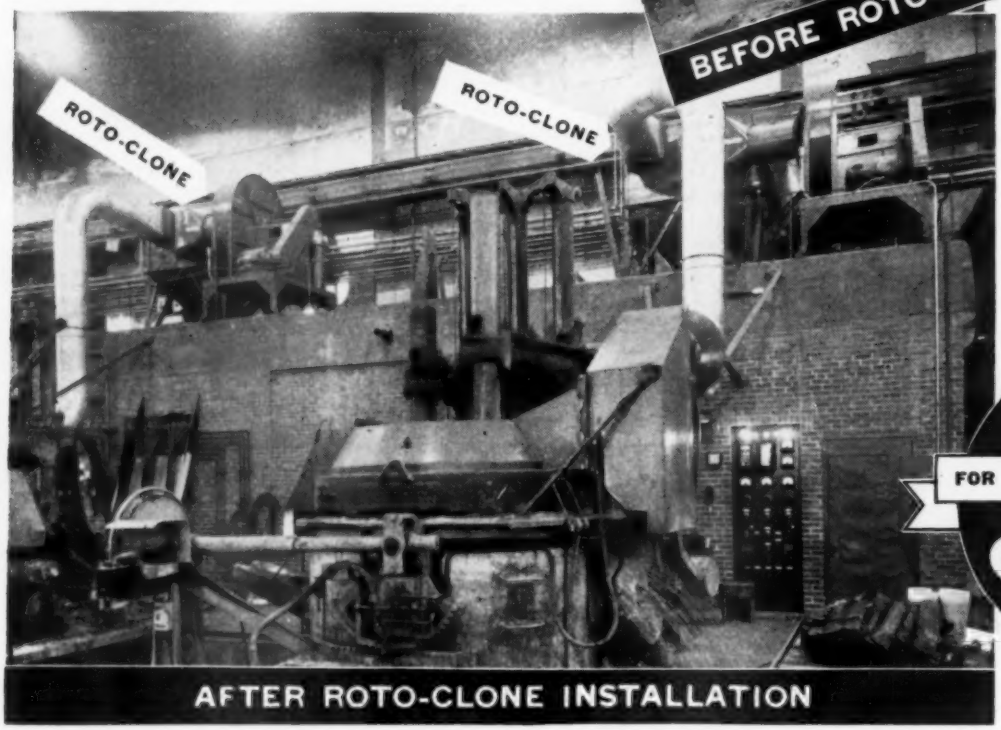
GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

BEFORE *and* AFTER

PHOTOGRAPHS PROVE EFFECTIVENESS OF ROTO-CLONE DUST CONTROL FOR ELECTRIC FURNACES

These unretouched photographs are visual evidence of Roto-Clone's efficiency in the control of electric furnace dust. Roto-Clone is equally effective in the control of dust at shakeouts, sand screens, belt transfers, magnetic pulleys, mullers, elevators, sandblast, casting cleaning, tumbling mills and grinding.



ROTO CLONE
FOR FOUNDRY DUST CONTROL

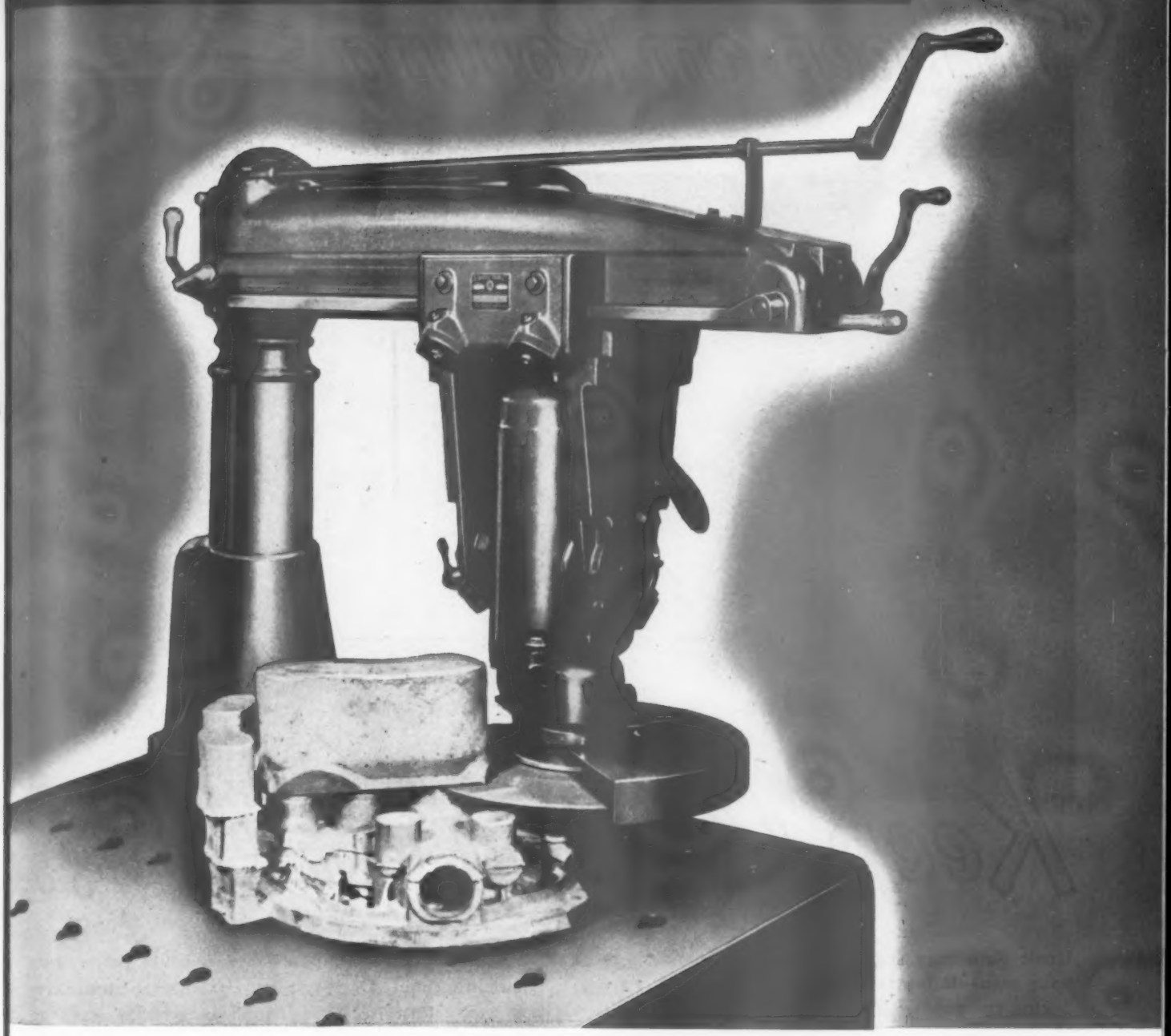
General ventilation is rarely adequate to control dust from electric furnaces. In the foundry where above pictures were taken, two Roto-Clones exhausting 16,000 c.f.m. completely eliminated the dust nuisance where more than 120,000 c.f.m. of general ventilation utterly failed. Other Roto-Clone advantages include regulation of air volumes up to the maximum required at high temperature peaks and an almost constant inflow of room air regardless of high temperatures attained when air passes thru the furnace hood.

Send for complete information on the Roto-Clone for all foundry operation dust control. Ask for Bulletin No. 274.

AMERICAN AAF AIR FILTERS

AMERICAN AIR FILTER COMPANY, INC., 266 CENTRAL AVE, LOUISVILLE, KY.
INCORPORATED
IN CANADA, DARLING BROTHERS, LIMITED, MONTREAL, P. Q.

Foundry METAL CUTTING MACHINE



Keeping ahead of trends in the processing of magnesium and aluminum castings, DeWalt introduces this specially designed machine for removing gates and risers. Completely new in foundry methods, this DeWalt puts the cleaning room *on a production schedule* and increases the efficiency of the entire foundry. Write for descriptive literature.

DE WALT PRODUCTS CORPORATION
LANCASTER, PENNSYLVANIA

HERE'S HOW

To keep 'em Rolling

Keep Rolling 'em Out!

Uncle Sam may still be calling more and more of your men—but you will be expected to keep producing the goods. You also have a moral obligation to these very men who are leaving your service to enter that of their Country.

Hermans can help you roll out molds faster than ever before which should help you to keep 'em rolling over there. Herman Molding Machines are known to have increased production five and six hundred per cent over old methods. Maximum efficiency and minimum molding cost is at your command in Herman Molding Machines.

The exclusive Herman Rollover saves power, cuts molding time. Gravity return of rollover plate saves power. Pattern draw equalizer adjusts itself to irregularities of flask and automatically locks assuring perfect draws, accurate to pattern. Automatic Timing for jarring and rapid Rotary Valve control minimize personal attention. Molds are deposited directly on the conveyer.

See a Herman engineer. He'll help you roll 'em out.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

METALLURGICAL TESTING

Precision work requires accurately molded and polished specimens

• A smooth-running vibrationless polisher encourages careful precision polishing

Buehler

specimen preparation equipment produces reliable results with speed and accuracy.

SINGLE UNIT POLISHING TABLE NO. 1516

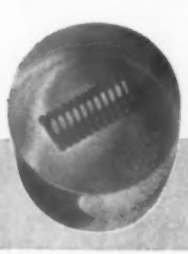
This cabinet type polisher combines the features of a smooth-running precision mechanism with unusual convenience and comfort for the operator. In addition to the polishing unit this table is equipped with a handy wash fountain and desicator cabinet for keeping specimens in good condition. The two speed control switch is placed in a convenient position and the entire unit is arranged for a high daily production of specimens. Every mechanical part of this polishing unit is finished to close tolerances and balance so that peripheral vibration is reduced to a minimum. The polishing disc is keyed to a tapered arbor on the motor by means of a stout sleeve. The disc is equipped with a new type cloth clamp for quick changing.

The BUEHLER line of specimen preparation equipment includes—

Cut-off Machines • Specimen Mount Presses
Power Grinders • Emery Paper Grinders
Hand Grinders • Belt Surfacers • Polishers
Polishing Cloths • Polishing Abrasives.

LEAD LAPPING DISC NO. 1526

Interchahgeable with the regular 8" disc on all Buehler polishers, the new polishing technique of the lead lapping disc is ideal for difficult metal specimens. The results are extreme flatness of specimens, a minimum of disturbed metal, retention of graphite and inclusions, and true dimensions on electro plate specimens. This method of polishing is gaining widespread popularity because of improved results.



Buehler Ltd.

PARTNERSHIP

METALLURGICAL APPARATUS

165 West Wacker Drive, Chicago 1, Illinois

Fremont Flasks again available in MAGNESIUM METAL

PROMPT ATTENTION GIVEN ALL ORDERS

FREMONT FLASKS have established a reputation for efficiency and long wear and in most progressive foundries have replaced the old type, cumbersome, heavy weight equipment.

The FREMONT FLASK with the 1" GROOVLOCK PIN is especially adapted to snap work but can also be furnished with cast ears to accommodate other pins.

Slip Flasks **FREMONT** Jackets

GROOVLOCK

THE FREMONT FLASK CO...FREMONT, OHIO

SAVE YOURSELF TROUBLE
—use CHATEAUGAY for your difficult castings

Chateaugay is Republic's low-phosphorus, copper-free iron with the ability to do things which other irons cannot do.

Take difficult castings of intricate design, for instance—castings with joining light and heavy sections. Chateaugay can save you money and headaches, because it flows with exceptional fluidity and fills completely.

Chateaugay Pig Iron has other important advantages, too. It is highly and uniformly machinable. You can turn, mill, drill or otherwise cut or grind castings made of this iron freely and economically.

Castings made of Chateaugay provide hard wearing surfaces—also resistance to heat and acids.

If you've never used Chateaugay, you have a pleasant and profitable surprise awaiting you. It makes difficult casting jobs seem easy.

A Republic Pig Iron metallurgist is ready to tell you all about this iron and how you can use it to best advantage in your foundry. Write us for further details.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Berger Manufacturing Division • Culvert Division
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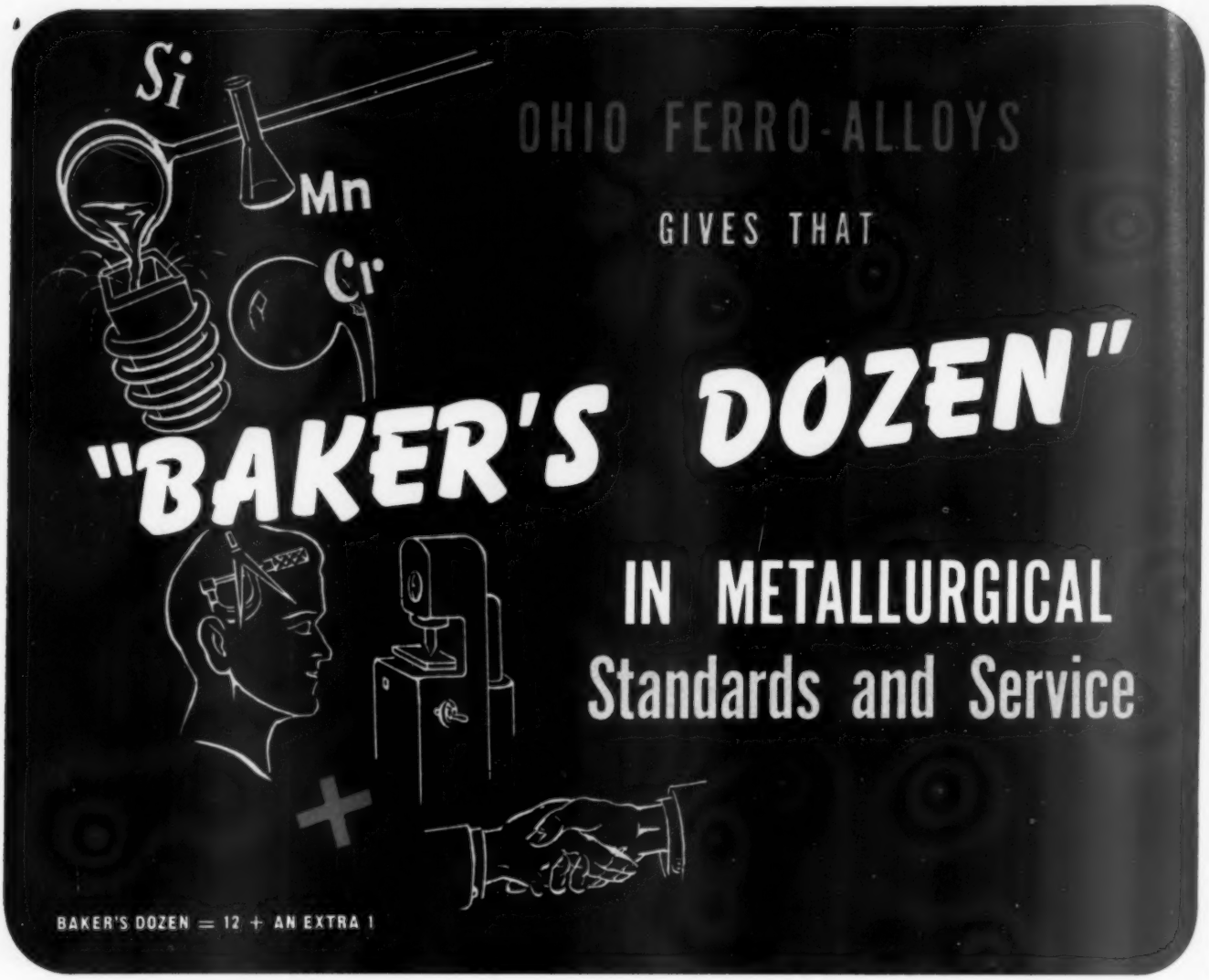
Export Department: Chrysler Building, New York 17, N.Y.

Republic PIG IRON

"CHATEAUGAY"	"REPUBLIC"	"PIONEER"
Low-Phosphorus, Copper-Free	(Northern) Foundry, Basic and Malleable	(Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS



The desirability of receiving more for your money than you bargain is of ancient origin. But in many cases product extras can not always be seen by the eye. "Extras" begin with constant research and development in maintaining higher metallurgical standards—they are shown by consistent "top" quality.

To attain commercially useful "extras," the organization must be versed in the problems and requirements of the iron and steel industry . . . This IS the *Ohio Ferro-Alloys Corporation.*

FERRO-SILICON 50%, 75%, 85%, 90%

FERRO-CHROMIUM • FERRO-MANGANESE

BOROSIL • SIMANAL

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OFA SILICON, MANGANESE, CHROME

PHILO — DEPENDABILITY · QUALITY · SERVICE

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Ohio Ferro-Alloys Corporation

Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma

GEHNRICH OVENS

BAKE FASTER MORE UNIFORMLY AT LOWER COST

Recirculated convection heating that distributes the heat over and through the entire load of cores no matter how varied or heavy the mass. Gehnrich Dual Panel Assembly that provides maximum thermal efficiency and ruggedness of construction. The handling system best suited to individual needs. These are the combination in Gehnrich Ovens that produces such superior performance economy, uniformly baked cores and molds and better castings. Let the Gehnrich Foundry Oven Book tell you how.

Core oven with 5 drawers which can be pulled out individually without disturbing the rest of the bake; heated through a narrow temperature range by a recirculation air heating system.

Integral convection heated mold oven equipped with a power operated lift door, heats a gross load of 150 tons. The air is circulated evenly through the heavy mass and recirculated through the combustion chamber, saving considerable heat and time and producing more uniformly dried molds.

Continuous monorail conveyor oven 90 ft. long, with recirculating, air convection heating system, handling a load of varied cores on carriers travelling 180 ft. through the two heat zones in 75 minutes.

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Blaw-Knox Co.
Baldwin Locomotive Works
Waterbury Farrell Foundry Co.
The Bullard Co.
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Otis Elevator Co.
Wright Aeronautical Corp.
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DISCOVER WHAT THESE TYPICAL USERS LEARNED ABOUT GEHNRICH OVEN PERFORMANCE

GEHNRICH OVEN DIVISION

W. S. ROCKWELL COMPANY

Batch Type and Conveyor Ovens • Oil - Gas - Electric - Steam - Coke

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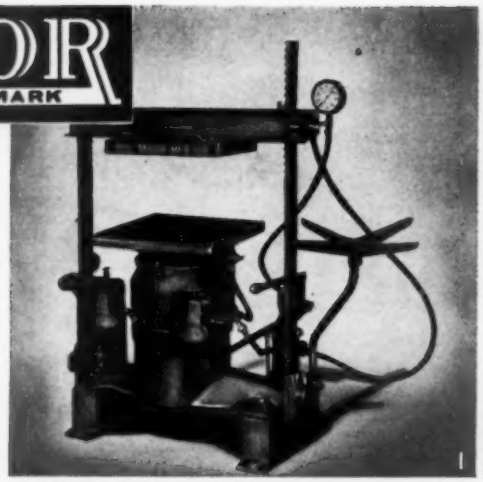
TABOR
TRADE 1884 MARK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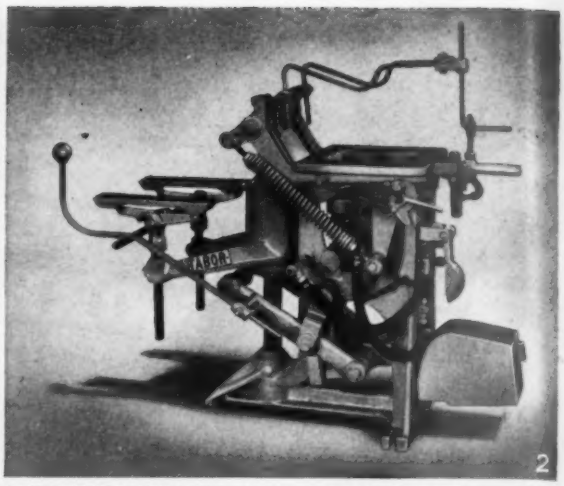
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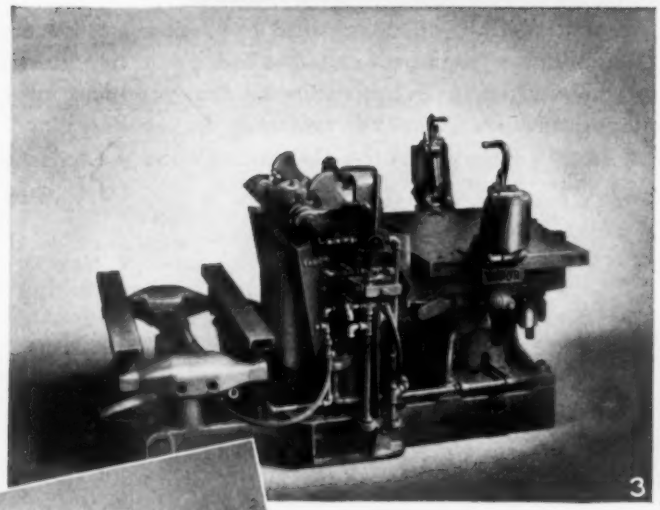
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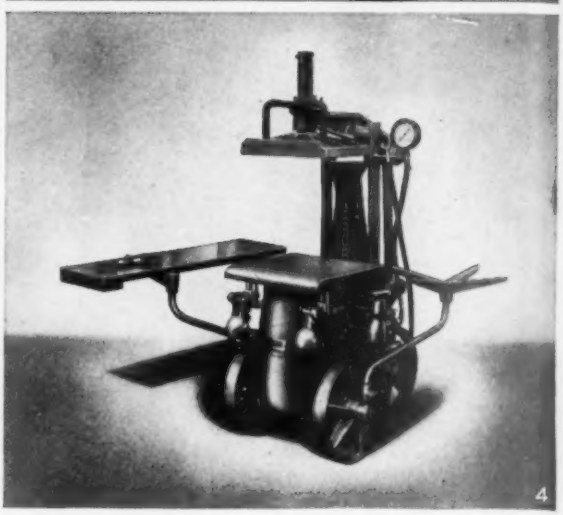
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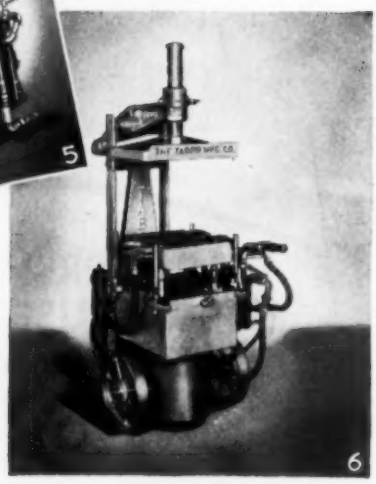

6

TABOR FOUNDRY MOLDING MACHINES

1. JAR SQUEEZER—Yoke Type
2. JAR-RAM HAND ROLLOVER HAND DRAW MACHINE
3. JAR POWER ROLLOVER POWER PATTERN DRAW MACHINE—with air operated flask clamps.
4. JAR SQUEEZER—Cantilever Type
5. JAR SQUEEZE FLASK-LIFT MACHINE—Pintle Post Type.
6. PORTABLE JAR SQUEEZE FLASK-LIFT MACHINE—with adjustable lifting pins.

The several types shown here are representative of the complete line of Tabor Foundry Molding Machines. Tabor can supply the right type of machine for any molding need . . . to gray iron, steel and non-ferrous foundries of any size. We have been designing, building and adding to the line for over half a century. So, whatever your molding machine problems, call on Tabor.

THE TABOR MANUFACTURING COMPANY
6225 Tacony Street • Philadelphia • Pennsylvania

Representatives: Snyder Foundry Supply Co., *Los Angeles, Calif.;* Pacific Graphite Works, *Oakland, Calif.;* Carl F. Miller & Co., *Seattle, Wash.*

EXTRA PROTECTION OUTSIDE

The cast iron frame and end shields are so constructed that the internal working parts of the motor are fully protected from falling dirt or dripping liquids.

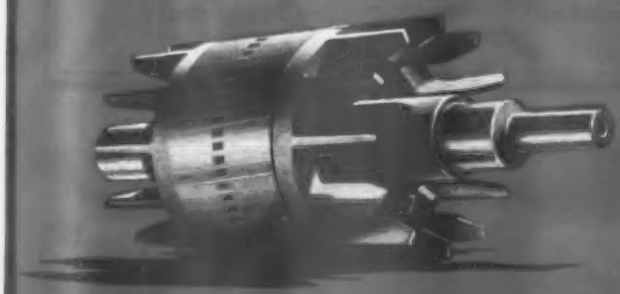
EXTRA PROTECTION INSIDE

Windings are protected from unusual moisture or dirt conditions by special "baked in" insulation treatment which greatly increases the life of the motor.

MASTER ELECTRIC MOTORS

1/10 TO 100 HORSEPOWER

THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

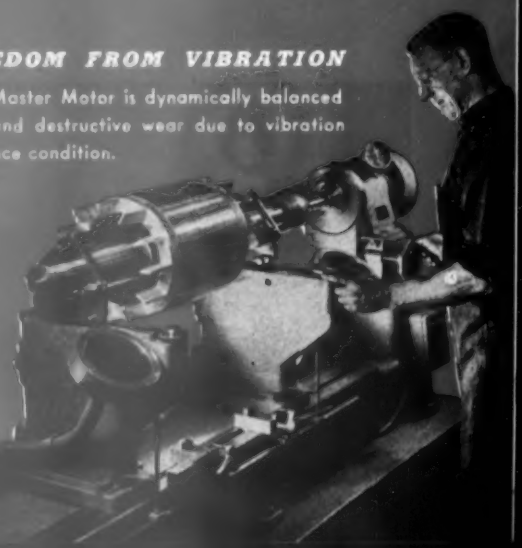


EXTRA RUGGED CONSTRUCTION

Unusually heavy alloy steel shafts and oversize bearings add greatly to the durability of Master Motors. In Squirrel Cage motors the rotor windings are cast integral with the rotor laminations.

EXTRA FREEDOM FROM VIBRATION

The rotor of every Master Motor is dynamically balanced to eliminate noise and destructive wear due to vibration from an out-of-balance condition.



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for the

IRON AND STEEL INDUSTRY

AVAILABLE FOR IMMEDIATE SHIPMENT

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With the first impact of war came the demand for greatly increased output of Alloy products. FULL SPEED AHEAD was vital to meet wartime needs. Mining operations accelerated . . . production facilities expanded, and now Alloys are being produced in quantities never approached in our history.

Today, with restrictions on Vanadium products removed from mandatory allocation, users can benefit by broader application of this important alloy element.

For present or future needs, you can profit by consulting us on your requirements. Our resources, and more than thirty years' experience with Ferro-Alloys and Metals are at your service; No obligation.

★

FERRO VANADIUM
Open Hearth, Crucible and Primos Grades

VANADIUM PENTOXIDE
(Fused and Air Dried)

FERRO TITANIUM
High Carbon Grade
Low Carbon Grades
(20-25% and 40%)

TITANIUM METAL
70% Titanium Grade

GRAINAL ALLOYS
Vanadium Grainal No. 1
Vanadium Grainal No. 6
Grainal No. 79

ALSIFER
A Ferro-Silicon-Aluminum Deoxidizer

FERRO CHROMIUM
High Carbon Grade
Low Carbon Grades
(from Max. .06% to Max. 2.00% Carbon)
Iron Foundry Grade

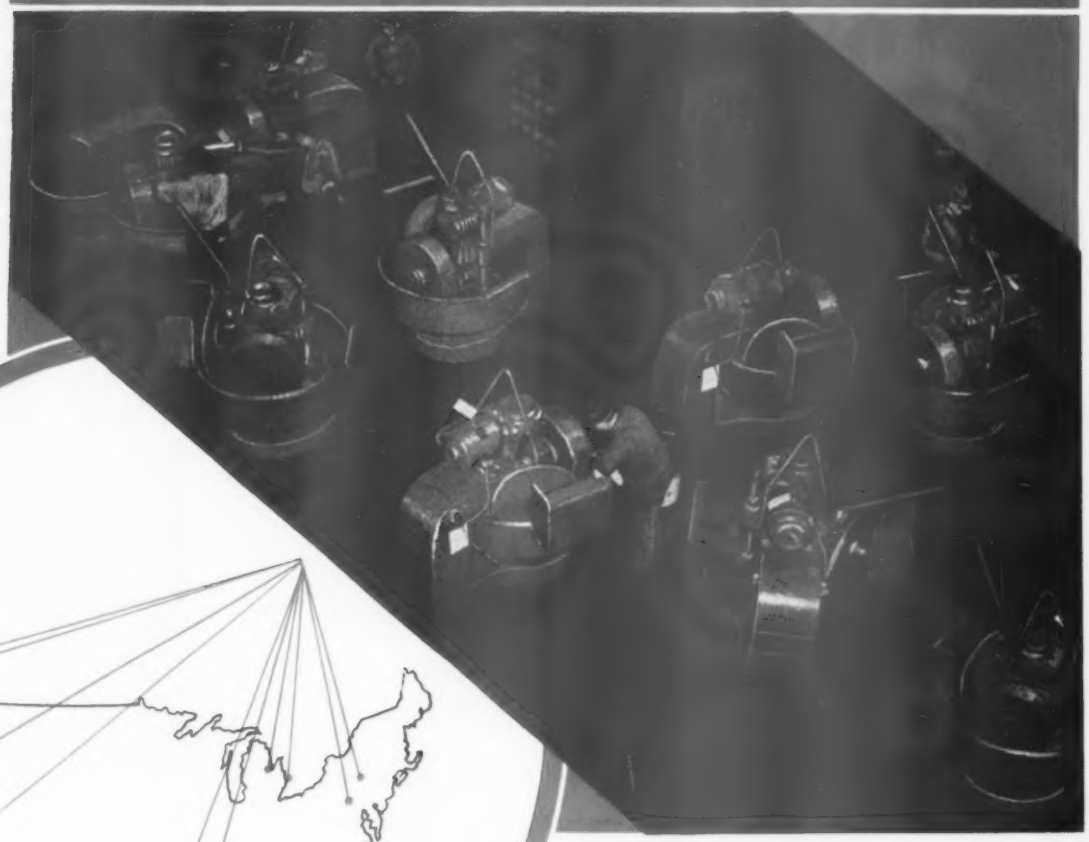
FERRO SILICON
26%, 50%, 75%
80-90%, 90-95%

CHROMIUM METAL
High Carbon Grade
(Chromium Carbide)

V-FOUNDRY ALLOYS
V-5 and V-7 Grades

GRAPHIDOX NO. 4
A balanced Alloy of Silicon, Titanium, and Calcium for maximum efficiency in graphitizing and deoxidizing.

ALL OVER THE MAP



Starting from our shop assembly floor, the Clearfield 404 Sand Mixer shown here, went out to the points indicated on the map, namely: Everett, Seattle, San Francisco, Denver, Houston, Detroit, St. Louis, Cleveland, Philadelphia, and Annapolis. This is a graphic indication of the wide acceptance and distribution of these small, sturdy, economical, and efficient machines.

Whether your need is for moderate sand production or larger, send us your inquiry. We have the Mixer.

WRITE FOR BULLETIN

CLEARFIELD MACHINE COMPANY

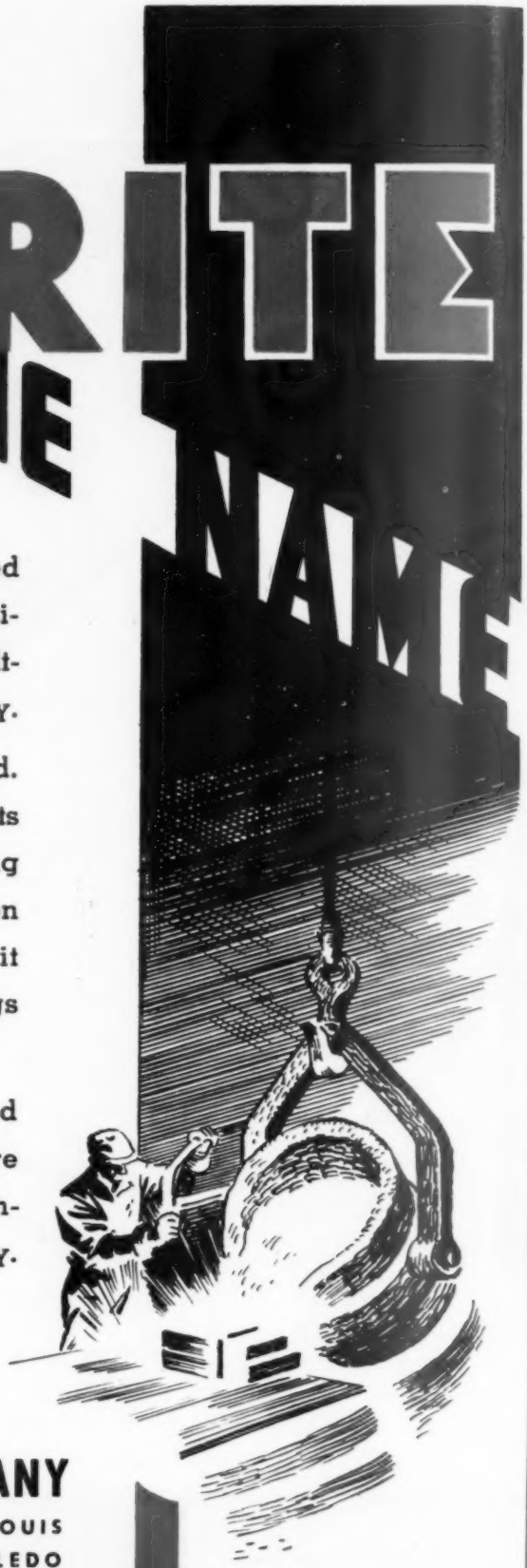
CLEARFIELD
PENNSYLVANIA, U. S. A.

BACK OF THE MELTRITE NAME

Following World War I, there developed tremendous demands for improved physical characteristics in metals. These resulted in important advances in metallurgy.

Makers of foundry products responded. We introduced the small Meltrite pig. Its greater uniformity and better melting qualities proved a notable contribution to this progress, as did the reduction it effected in foundry losses, and savings in fuel and labor.

Today, Meltrite is the most widely used merchant pig iron. Back of the name are pioneering, progress, performance throughout our 61 years of service to industry.



P M

PICKANDS MATHER & COMPANY

CLEVELAND • CHICAGO • DETROIT • ST. LOUIS
ERIE • DULUTH • MINNEAPOLIS • TOLEDO

New York City — William R. Alley
Philadelphia, Pa. — Carson, Marshall & Co.
San Francisco and Los Angeles, California; Seattle and Tacoma, Washington — H. L. E. Meyer Jr., & Co.

IRON ORE • PIG IRON • COAL • COKE

How to Keep Foundrymen on Their Feet

. . . and put more man-hours to work

AO leggings are an important item in keeping foundrymen *on* their feet—and *off* the casualty list.

In a pair of trim fitting American Optical leggings, designed for a particular type of operation, a foundryman has the protection he needs to work *freely*. These AO safety items are built for free action and insulated against heat transmission. To prevent bunching and crumpling on leggings, the flare is cut to generous proportions and shaped to fit the natural curve of the instep. And to assure longer wear, AO leggings are double stitched or steel sewed with reinforcing at vital points.

Hip leggings are available in leather and asbestos. Knee-length leggings are made in the same materials, also in specially treated fire-resisting duck.

The Representative from your nearest AO Branch Office can help you select the proper type of leggings for your foundry needs. Call him today.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

GET MORE *MAN-MINUTES* OUT OF EVERY MAN-HOUR—GET AO SAFETY CLOTHING!

CLEAN CASTINGS
INCREASE PRODUCTION

TAM FOUNDRY ZIRCONITE SAND YIELDS SMOOTH CASTINGS AND REDUCES CLEANING TIME

TAM Foundry Zirconite Sand used for the entire mold or as a facing sand resists the burning in of the metal and makes possible the production of clean castings and the expansion of output by reducing time in the cleaning department.

TAM Foundry Zirconite Sand does not warp, requires minimum venting and the faster chilling permits better metal distribution into heavy sections and reduces "hot tears"! Four important factors.

TAM Foundry Zirconite Sand is available in three grades, Zirconite Sand A has an approximate melting point of 3812° F. Zirconite Sands B and C 3650° F.

Full particulars on the proper applications of Foundry Zirconite Sands will be sent immediately upon request. Write:

TITANIUM
ALLOY MANUFACTURING COMPANY

TAM Foundry Zirconite Sand "A" was used in the core for the chrome steel impeller wheel illustrated. Note the clean, smooth surfaces.

TAM ZIRCONIUM TITANIUM PRODUCTS
Registered U. S. Pat. Off.

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

Representatives for the Pacific Coast . . . BALFOUR, GUTHRIE & CO., San Francisco, Los Angeles, Portland, Seattle, Tacoma
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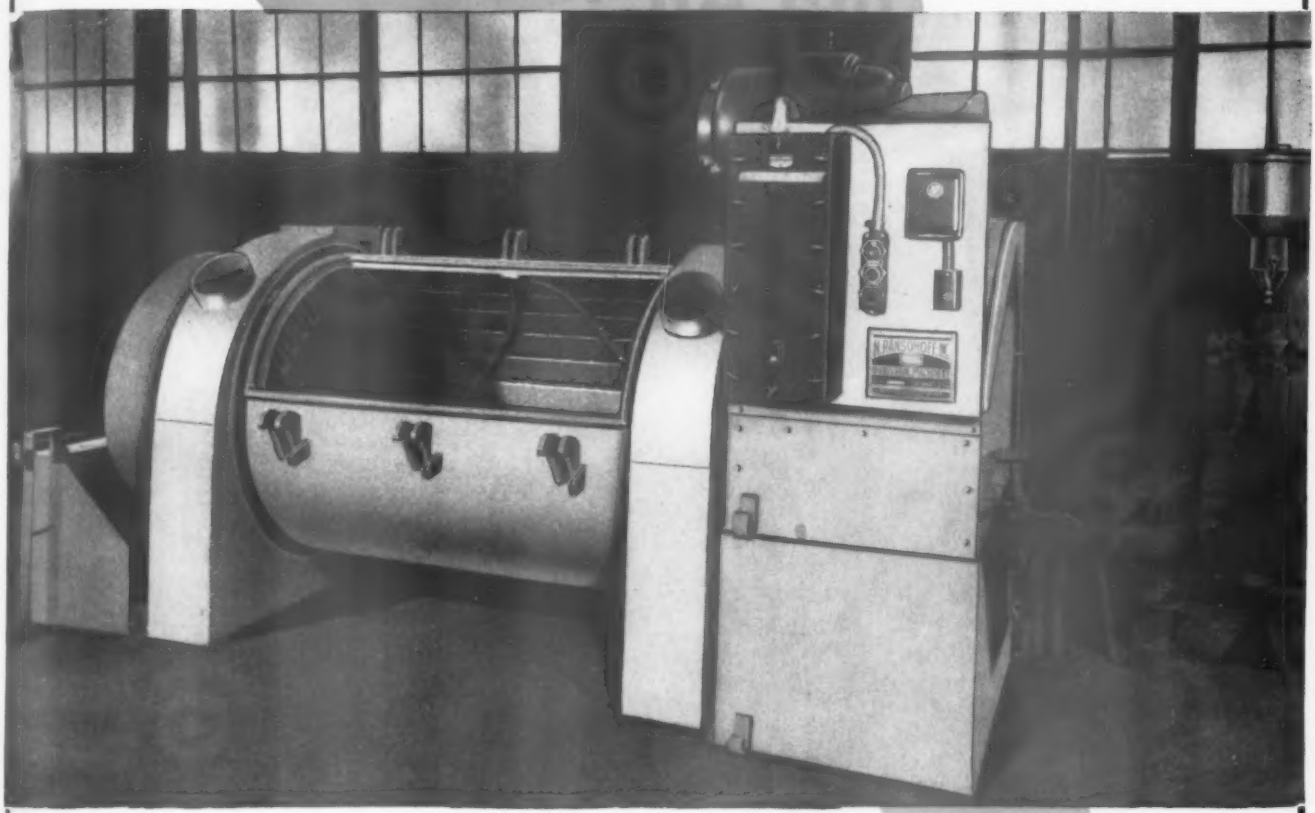
Ransohoff *Automatic Star-Return*

WET CLEANING MILLS



CLEANING TIME SLASHED

Figure it in dollars and cents . . . the total saving will cut your costs plenty!

Or, figure how quickly this machine will pay for itself in money saved!

This side-loading, side-unloading machine is kept busy cleaning motor end-bells and miscellaneous motor castings . . . not a very easy task, but one which RANSOHOFF WET CLEANING MILLS tackle without fear. And you gain the labor-saving, time-saving, cost-saving results when you figure what 65% savings per batch is worth to you.

This wet cleaning mill is equipped with a rinsing unit to rinse work before discharge to insure cleanliness and brightness. At the extreme right you'll note the RANSOHOFF DISPENSER which holds the basic solution for rinsing.

Send us a sample batch . . . let's discuss your individual problem . . . no obligation.

65%

N. RANSOHOFF, Inc. CINCINNATI, OHIO
Township Ave. and Big 4 R. R.

How to pull HEAVIER PRODUCTION out of "Thin Air"!

Simple Foxboro Air-Weight Controller installations like this increase output per cupola by ½ to 1 ton daily!

Even First Pours produce top-grade castings ...with Foxboro Air-Weight Control

UNLESS you've watched cupolas operate with Foxboro Air-Weight Controllers on the blast, it's hard to realize how much this simple, inexpensive installation can improve production!

Here's why. The Foxboro Air-Weight Controller is an automatic instrument that exactly controls the blast by *weight* of air, instead of volume. Set it for the correct air-coke ratio, and it will maintain uniform melting conditions day-in, day-out, regardless of the weather.

Heats are uniformly hotter, without burning . . . pigging is entirely eliminated. Metal characteristics are importantly improved . . . from start to finish, every pour gives flawless, quality castings. What's more, you get this better operation with an improved iron-coke ratio!

Write for Bulletin B-268 describing this easily-installed production-booster! **The Foxboro Company, 32 Neponset Avenue, Foxboro, Mass., U. S. A.** Also Montreal, Canada. Branches in principal cities.

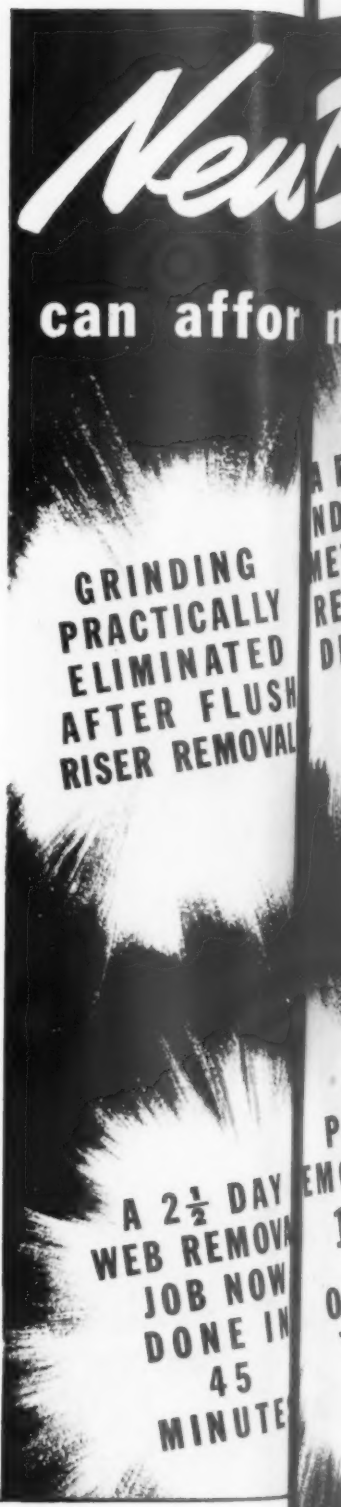
AIR-WEIGHT CONTROLLERS BY FOXBORO

Reg. U. S. Pat. Off.

LOOK TO
MILWAUKEE
FOR BETTER
MOLDING MACHINES
MILWAUKEE FOUNDRY EQUIPMENT CO.

Here's a

no Steel Foundryman



If you're a steel foundryman, faced with wartime production problems or engaged in post-war planning, here's a new Airco book you owe it to yourself to read.

It describes and explains for the first time new and improved methods involving use of the oxyacetylene flame and electric arc to smash finishing bottlenecks and slash finishing costs.

It's full of practical ideas, developed by Airco engineers in cooperation with steel foundrymen, that are helping foundries to consistently break production records despite serious manpower shortages and that offer vast possibilities for speeding operations and slashing costs after the war.

Thirty-two pages, profusely illustrated, it gives all the facts about these new developments, proven in the crucible of war — shows, in actual photos and figures, the superior results and tremendous savings in time and cost which they accomplish and lists equipment for putting them in operation in your own plant.

It's a book you can use to advantage today and will need to meet post-war competition.

Send for your free copy now. Tear off and mail the coupon at the right.

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A FASTER AND BETTER METHOD OF REMOVING DEFECTS!

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CASTINGS THOROUGHLY DESCALED IN A FRACTION OF THE TIME!

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Gentlemen: F

Kindly forward a copy of your new booklet "New and Improved Oxyacetylene Methods for Steel Foundries" to

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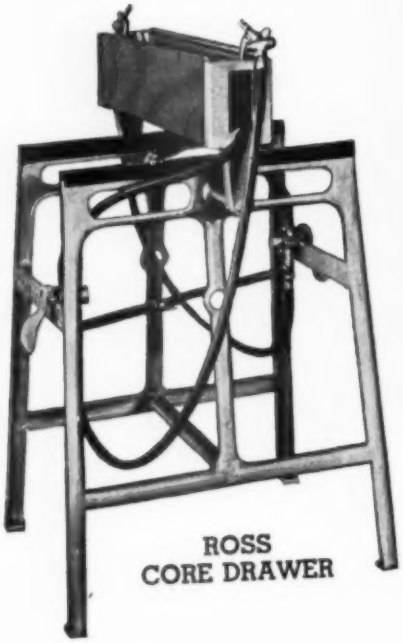
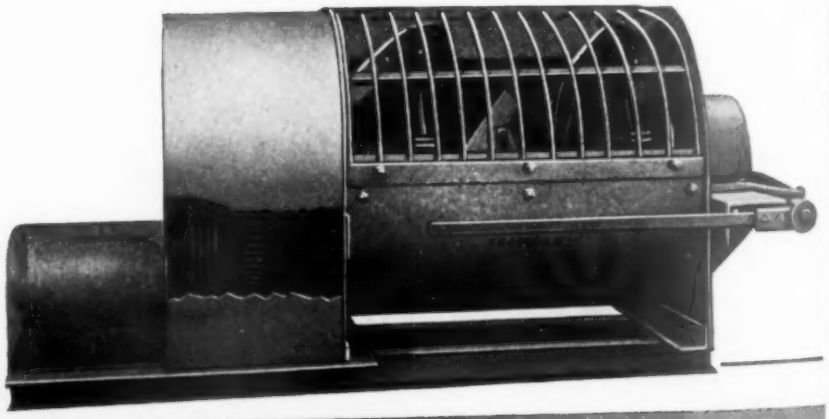
GAST CORE AND MOLD SPRAYER



ROSS
CORE DRAWER

FREEMAN MULTI-BLADE
FOUNDRY MIXER



The Freeman Supply Company

Pattern Shop & Foundry Supplies & Equipment

Mahogany and Pine Pattern Lumber

1152 East Broadway TOLEDO 5, OHIO Tel. TAylor 4624

Technical Progress To Aid Steel Foundries In Meeting Post War Competition

SPURRED on by war demands much greater in volume and more critical in specifications than anything previously experienced in history, the steel foundry industry has met every challenge. Through efforts of individual companies, through research and study, and through the pooling of the knowledge of the industry, steel foundrymen have been able to make remarkable progress in both practice and product. Production has reached a tremendous volume, and the service demands now being met by cast steel probably would have appeared fantastic if attempted during the first world war. In tanks, airplanes, guns, ships, trucks and hundreds of other items of war materiel, steel castings are helping allied soldiers maintain superiority over the enemy.

While military security has prevented the complete revelation of developments which have been made, some indication of trends is beginning to appear in technical papers and discussions. Valuable developments have been made in the production of steel castings in centrifugal molds, in the melting and refining of steel for castings, in the manipulation of alloys and other raw materials, in the control of metal during solidification, and in the heat treatment of castings, to mention only a few. An interesting example of the effect of war demands in accelerating the use of a particular practice in the steel foundry is to be found in the article by Charles W. Briggs on water quenching of steel castings, which starts on page 58 of this issue. This paper is a part of a symposium presented at the annual meeting of the Steel Founders' Society.

Mr. Briggs points out that although water quenching has been practiced for 35 years, recognition of the benefits to be derived from the process has been exceedingly slow in developing. Water quenching was used by John Howe Hall at the Taylor-Wharton Iron & Steel Co. as far back as 1908, but for many years few foundries used the process and few buyers of steel castings believed that quenching could be used safely to improve the mechanical properties of cast steel. In fact as late as 1930, two of the three leading A.S.T.M. specifications for steel castings stated that castings quenched in any liquid could not be offered for sale under the specifications and the third specified that only annealing could be employed. Not until 1933 did the A.S.T.M., through a tentative specification, recognize the respectability of the quenching process.

Liberalization continued and by 1939 clauses listing requirements for liquid quenching were included in practically all A.S.T.M. specifications. But both the Army and Navy continued to shy away from water quenching of steel castings. Then the war brought the need for high tensile-high yield castings of a design that required water quenching. About the same time it was learned that excellent ballistic properties in steel castings were produced by water quenching. As a result, production of quenched and tempered steel castings jumped from approximately 5000 tons or less than one half of one per cent of the total output of cast steel in 1940, to an estimated 250,000 tons or 8 per cent of the total production in 1943. When engineers realize that cast steels and wrought steels of similar compositions develop comparable properties after quenching and tempering operations, the application of that practice in the steel foundry should increase greatly. Mr. Briggs believes that in the 10-year period following the war approximately 50 per cent of the alloy steel castings produced for sale will be liquid quenched and tempered.

In any study of recent progress in the production of steel castings, the Steel Founders' Society of America must be credited with intelligent leadership. Its Technical and Operating Committee has organized the operating executives and technical men of the industry for the purpose of "improving the quality and increasing the usefulness of steel castings." Through that committee valuable information on such subjects as centrifugal casting of steel and liquid quenching of steel castings has been collected for the benefit of both foundrymen and the users of steel castings. The Technical Research Committee now is at work on six projects which should produce data of value to both producers and consumers. The Advertising Committee of the society is carrying on a carefully planned and well executed advertising program in the technical press which illustrates and describes the many advantages of steel castings and then advises the manufacturer or engineer to "Modernize and Improve Your Product with Steel Castings."

Co-operation among steel foundrymen has permitted the steel castings industry to meet the tremendous demands of war. That same co-operation is strengthening the industry for the period of intense competition which will come with the peace.

Frank G. Steinebach
Editor

Developments in the Water Quenching of STEEL CASTINGS

By CHARLES W. BRIGGS
Technical and Research Director
Steel Founders' Society of America

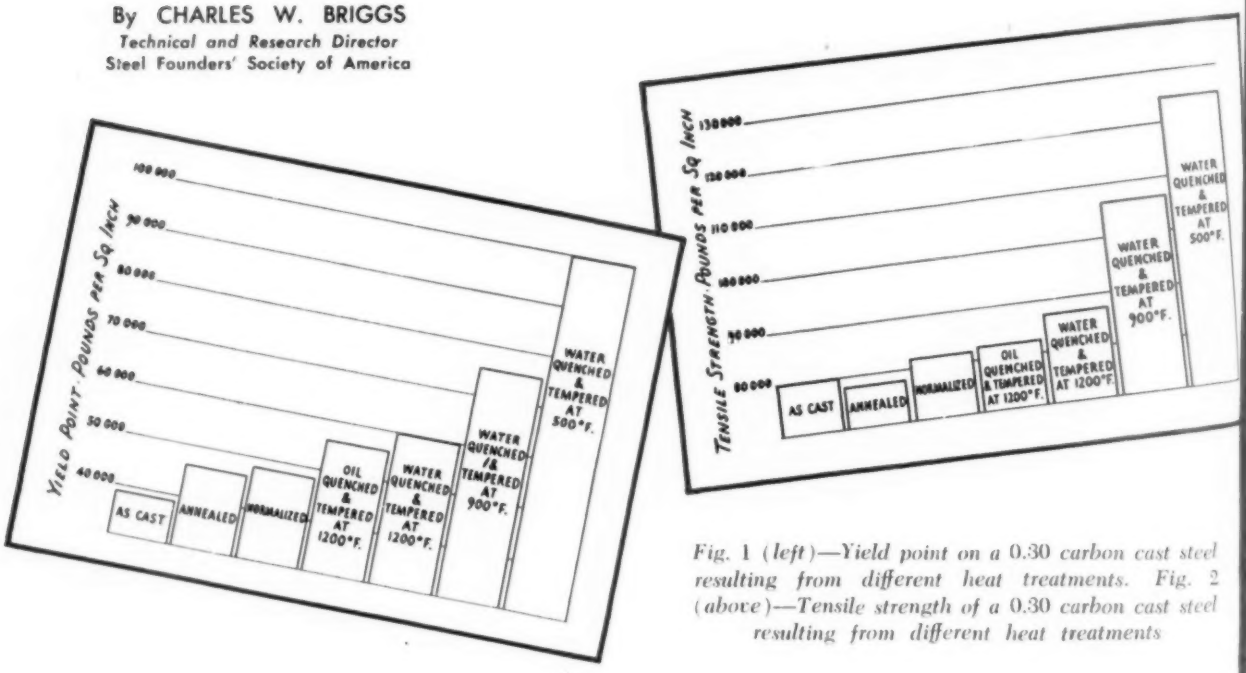


Fig. 1 (left)—Yield point on a 0.30 carbon cast steel resulting from different heat treatments. Fig. 2 (above)—Tensile strength of a 0.30 carbon cast steel resulting from different heat treatments

THE history of the water-quenching of commercial steel castings goes back about 35 years. Published information on the subject reveals that the Taylor-Wharton Co. water-quenched gold dredge buckets under the direction of John Howe Hall in 1908. The buckets were made of carbon cast steel. In 1909 this company developed a medium manganese cast steel as a water-quenching steel for different cast steel products.

In 1913, Hall presented a paper on the heat treatment of cast steel before the American Society for Testing Materials, in which he set forth the advantages of the water-quenching of cast steel. Those who discussed the paper stated that water-quenching might do very well to give fine microstructures to laboratory test bars, yet this treatment of actual castings would be out of the question on account of the danger of setting up serious stresses and cracking the castings.

Hall subsequently showed, in a paper given before the October, 1913, meeting of the American Institute of Mining and Metallurgical Engineers on shock tests of cast steel, that quenched and tempered castings were much to be preferred, and that cracked castings were not necessarily produced during the operation of water-quenching.

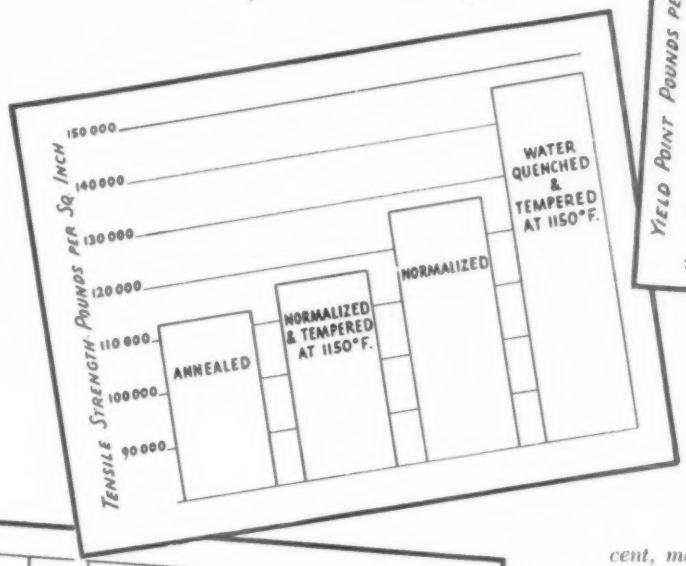
During 1914, a paper on the heat treatment of steel castings was presented by Young, Pease and Strand before the American Institute of Mining Engineers. The authors discussed the general improvements that could be obtained in the properties of steel castings by the water-quenching of castings.

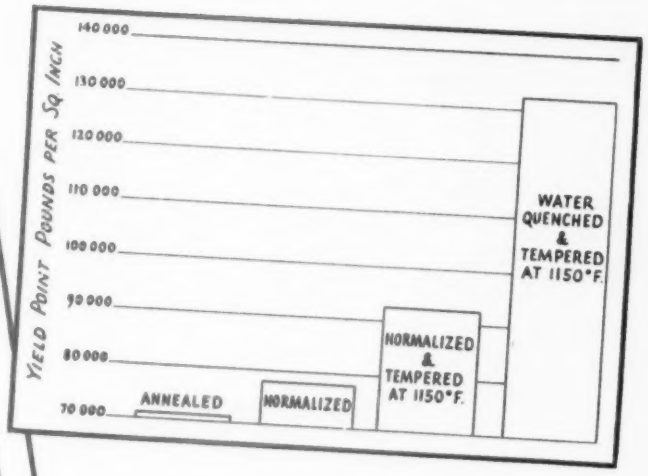
The authors were associated with the Pennsylvania railroad and they made their studies on bolster castings. The bolsters were given a 1600-degree Fahr. water-quench. and tempered at 900 degrees Fahr. The properties were reported on test bars cut from sections of the bolsters. This was the first time on record in this country that the purchaser of steel castings showed an interest in water-quenched steel castings.

In a discussion of the paper by Young, Pease and Strand, Hall stated that it was most gratifying to find that others had found that the danger of cracking castings by quenching them in water had been greatly exaggerated.

Taylor-Wharton continued with its practice of the water-quenching of steel castings and, in 1917 and throughout the first World war, they produced gun carriage castings from medium manganese steel quenched and tempered.

Quenching treatment of commercial castings will be the major steel casting development of the war, the author states. This and succeeding articles on the subject comprise papers presented at the annual meeting of the Steel Founders' Society of America held in Chicago.





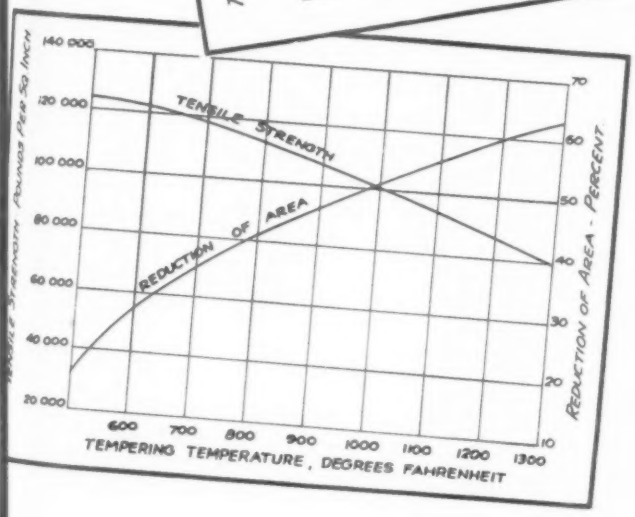


Fig. 3 (left below)—Effects on tensile strength and reduction of area obtained by varying the temperature at which 0.30 carbon cast steel is tempered after quenching. Fig. 4 (left center)—Tensile strengths of an alloy cast steel (carbon 0.30 per cent, nickel 1.68 per cent, chromium 0.55 per cent, molybdenum 0.27 per cent) resulting from different heat treatments. Fig. 5 (right above)—Yield points of an alloy cast steel (same as sample in Fig. 4) resulting from different treatments

In 1920, Hall, Taylor and Nissen published an article in the *Transactions* of the American Institute of Mining and Metallurgical Engineers on the heat treatment of cast steel, in which numerous tables appear on the properties of carbon and medium manganese cast steels in the quenched and tempered condition.

Prior to the period of the first World war, the steel casting industry produced for sale most of the tonnage in the as-cast or full annealed condition. The first World war brought about an advancement in heat treating conditions for many foundries in the industry, and a large proportion of their products was given a normalize treatment or a normalize and temper treatment.

The normalizing treatment became the popular commercial heat treatment after the war, and its use gradually increased during the period 1920 to 1940. Commercially, the annealing heat treatment was used less frequently during the period 1920 to 1940, and toward the latter part of that period the annealing heat treatment was seldom given except to meet specification requirements calling for this type of treatment on steel castings.

The tonnage of quenched and tempered castings sold during the 1920's was not great, and the total tonnage was produced by less than a dozen foundries. In 1930, considerable interest was exhibited in the quenching of steel castings, and a number of men in the industry wrote papers for various journals on the properties of quenched and tempered alloy cast steels.

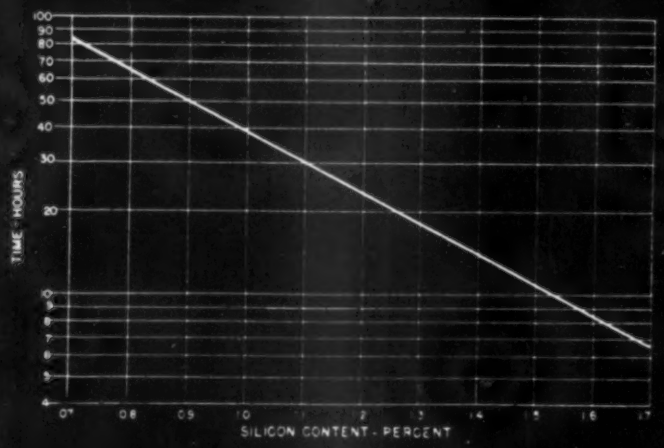
Buyers of steel castings became more interested in the properties of quenched and tempered steels, and greater interest was exhibited in the operation by foundrymen and foundries.

The leading specifications on steel castings in 1930 were the three American Society for Testing Materials Specifications: A 27-24, Steel Castings; A 87-27, Carbon-Steel Castings for Railroads; and A 95-29, Carbon-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service.

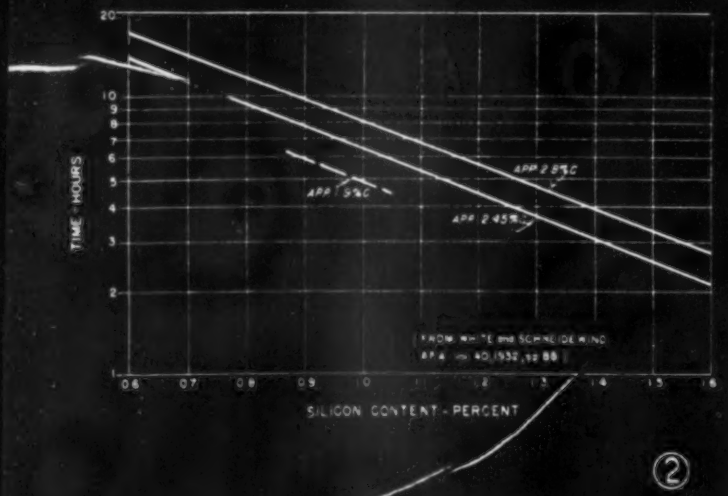
Specifications A 27 and A 95 carried the following clause: "No castings which have been quenched in any liquid medium shall be offered under these specifications." Specification A 87 required that castings be furnished only in the annealed state.

It can be seen from these specifications that at as late a date as 1930, neither buyers nor producers of steel castings generally welcomed standard specifications for high mechanical properties which required quenching and tempering heat treatments.

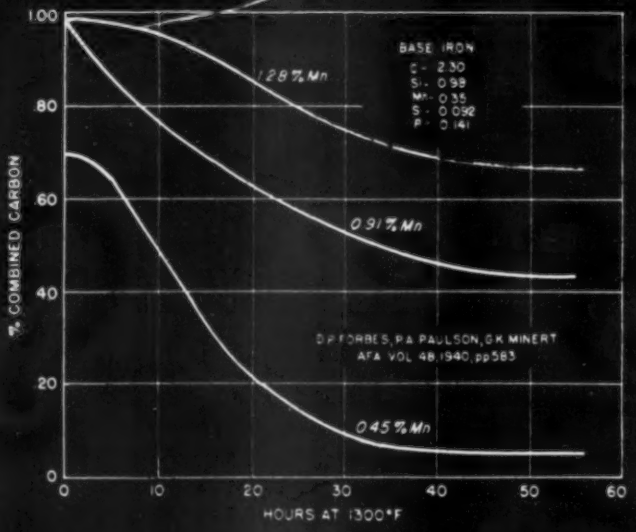
It was 1933 before a tentative specification was adopted by A.S.T.M., permitting liquid quenching and tempering of steel castings. The specification adopted was A 148-33T, Alloy-Steel Castings for Structural Purposes. This specification offered three grades which permitted liquid-quenched and tempered castings. (*Please turn to page* 132)


TIME - HOURS
SILICON CONTENT - PERCENT

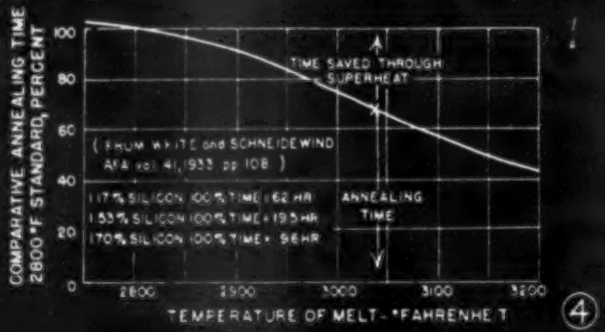
①


TIME - HOURS
APP 2.8%C
APP 2.45%C
(FROM WHITE and SCHNEIDEWIND
AFA vol 40,1932, pp 88)
SILICON CONTENT - PERCENT

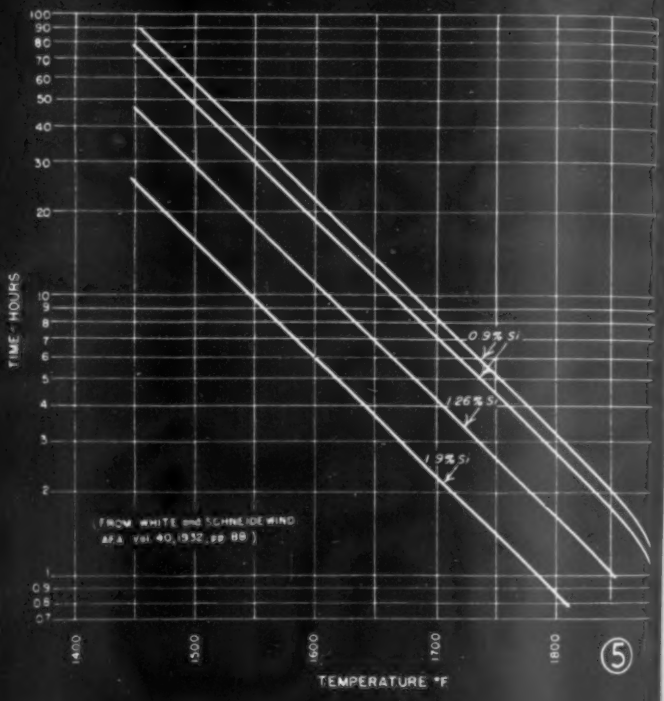
②


% COMBINED CARBON
BASE IRON
C - 2.30
Si - 0.98
Mn - 0.35
S - 0.092
P - 0.141
1.28% Mn
0.91% Mn
0.45% Mn
D.P. FORBES, P.A. PAULSON, G.K. MINERT
AFA VOL 48, 1940, pp583
HOURS AT 1300°F

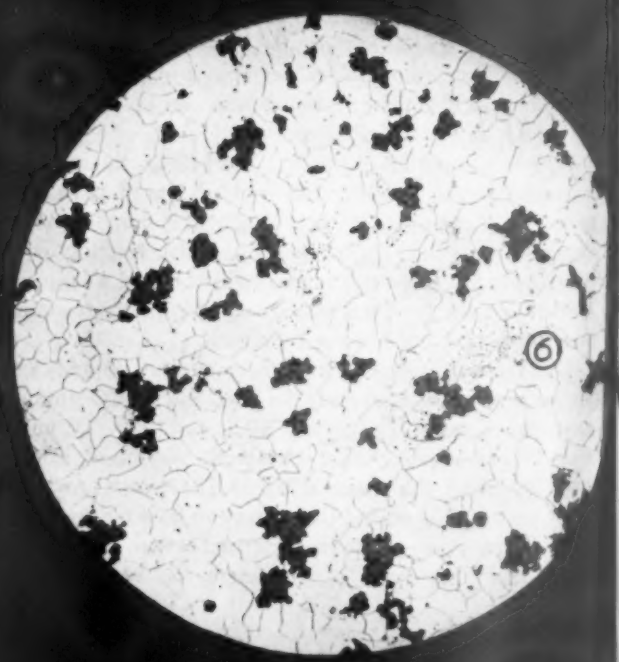
③


COMPARATIVE ANNEALING TIME
2800°F STANDARD, PERCENT
TIME SAVED THROUGH SUPERHEAT
(FROM WHITE and SCHNEIDEWIND
AFA vol 41, 1933 pp 108)
1.17% SILICON 100% TIME = 62 HR
1.53% SILICON 100% TIME = 19.5 HR
1.70% SILICON 100% TIME = 9.6 HR
ANNEALING TIME
TEMPERATURE OF MELT - °FAHRENHEIT

④


TIME - HOURS
0.9% Si
1.26% Si
1.9% Si
(FROM WHITE and SCHNEIDEWIND
AFA vol 40, 1932, pp 88)
TEMPERATURE °F

⑤



⑥

Graphitization of Malleable Iron

Co-ordination of foundry operations and metallurgical control is essential to shorten annealing time, as discussed in this paper presented at the Regional Foundry Conference held by the Wisconsin Chapter of the A.F.A.

ULTIMATE goal in annealing of white iron is to complete the process in the shortest possible time consistent with the production of good quality malleable. Shortening of the annealing process can be attained in a number of ways, through foundry operations and through metallurgical control. When foundry operations and metallurgical control are co-ordinated, progress in the attainment of shorter annealing cycles is accelerated, for few of the metallurgical aids to annealing can be exploited unless foundry operations are also in step to reap the benefits.

To those who might desire to shorten the annealing cycle, the problem is not insurmountable though it may be difficult. They have within their means some control of the annealing temperature of the metal composition, of the character of the raw materials which are used in the furnace charge, and of the melting and casting conditions, all of which, in one way or another, affect the rate at which the iron will graphitize.

Two prime factors in the control of graphitizing rates are the composition of the iron and the temperature of heating for the first stage of annealing. In regard to composition, the silicon content is the important variable and anything which one might do to vary the silicon content one way or another will affect the annealing rate profoundly. It is a well established fact that the time for both first and second stage graphitization decreases rapidly with increased silicon content. The effect of silicon on both stages of graphitization has been determined by White and Schneidewind several years ago, and their results have been reproduced in Figs. 1, 2 and 3. Graphitization, according to their work, decreases logarithmically with increasing silicon content. In support of these laboratory findings, MacMillan reported that the effect of silicon, in commercial practice, is such that it requires six to eight times as long to complete the first stage of graphitization with iron containing 0.90 to 1.10 per cent silicon as required with an iron with 1.54 to 1.79 per cent silicon.

The increased rate of graphitization with increasing silicon content is accompanied by an increase in the number of graphite nodules formed. While we may say, then, that silicon has an effect on graphite nuclei formation, nevertheless such an explanation for the fact that silicon speeds up graphitization still leaves much to be desired.

In the production of short cycle malleable, higher than normal silicon contents are employed to facilitate rapid annealing. Silicon contents of the order of 1.40 to 1.70 per cent are common in such irons for castings up to 1 inch in section. In most cases, the castings are made free from primary graphite through control of the metal in the melting furnace. This evasion of primary graphite is apparently not too difficult to achieve in production castings. MacMillan reported in a recent paper that out of 466 heats from an air furnace producing short cycle malleable only four heats were made showing primary graphite in sections which should be clear to produce a satisfactory casting. One of the important features of the process is to provide sufficient time (*Please turn to page* 144)

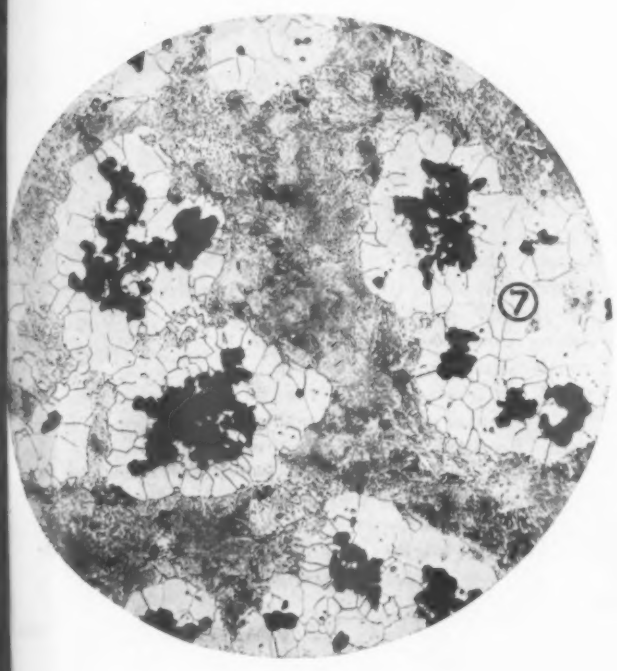


Fig. 1—Effect of silicon on second stage annealing. Fig. 2—Effect of silicon and carbon on time to reach equilibrium at 1675 degrees Fahr. (Kikuta). Fig. 3—Effect of manganese on amount of combined carbon in malleable iron after treatment for various periods of time. Fig. 4—Graph showing effect of superheat on annealing time. Fig. 5—Effect on temperature on time necessary to complete first stage malleablization
Fig. 6—Structure of specimen of short-anneal malleable iron which was annealed completely. Etched with nitric acid and alcohol, 100 diameters. Fig. 7—Structure of short-anneal malleable iron incompletely annealed. Etched with nitric acid and alcohol, 100 diameters

Producing COPPER-ZINC-SILICON BRONZE Casting

By R. J. KEELEY
Metallurgist
Ajax Metal Co., Philadelphia

ON THE subject of copper-zinc-silicon bronzes, it may be illuminating to study a few defective castings and to illustrate the way in which such defects were corrected. Specimens in Fig. 11 were sent by one foundry for such observation. The single machined casting was satisfactory, but the two castings attached to the runner show a white incrustation on the surface of the metal. The detached machined and finished small flange bushing represents the successful end product desired, and the visible casting defects represent an excellent example of what happens when this type of silicon bronze is poured at too high a temperature. They were, in fact, poured at 2200 degrees Fahr., while the pouring temperature of the finished casting had been 1900 degrees Fahr., normally the correct pouring temperature for this composition of 4.80 per cent silicon, 13.70 per cent zinc, remainder copper. A laboratory test of the white deposit proved it to be chiefly zinc oxide with a small percentage of silicon oxide.

Surface of Casting Is Defective

In Fig. 10 is seen a specimen representing a section cut from a cylindrical solid casting. It will be perceived, in addition to the central shrink, that the surface of this casting is defective, showing a drossy and pitted condition which extends very uniformly around the entire circumference of the specimen to a depth of 3/16 inch. Opinions differed as to the possible cause. As a result, a research program was set up, having as its objective the deliberate reproduction of the defect so as to determine the cause. Metal of the same composition was selected, having 4.80 per cent silicon, 13.80 per cent zinc, the remainder copper. A wood pattern was chosen having the same dimensions as the casting from which the defective portion was cut. The pattern was approximately 5 inches in diameter and 6 inches long. Several castings, as indicated by samples shown in Fig. 14, were poured vertically with riser at the top, fed by a horn gate at the bottom. Furnace charges consisted of 100 per cent ingot, and melting was performed in an oil-fired crucible lift-out furnace. All molds were of Albany No. 1 green sand. The first casting was poured to determine the effect of low pouring temperatures. The crucible therefore was removed from the furnace as soon as the metal was melted, the casting being poured at the extremely low temperature of 1750 degrees Fahr. This test failed in its objective; the actual

Fig. 10—Section cut from cylindrical solid casting, showing defects deliberately reproduced later. Fig. 11—Effect of excessive pouring temperature shown in portion of silicon bronze casting spray. Machined coupling is sound casting and was made from metal not overheated in the melt. Fig. 12—Small bearing for newsprint press. Bearing and small elbow casting (Fig. 13) both made of silicon bronze melted in coke-fired pit furnace and poured in green sand molds at 1900 to 2000 degrees Fahr. Fig 14—Cylindrical castings made in tests to determine effect of variations in pouring temperature

Procedure followed in correcting certain casting defects is described in this second and concluding article on the general subject of producing silicon bronze castings. A major cause given for inability to produce sound castings from these alloys is overheating due to failure to recognize the high fluidities present at relatively low temperature.

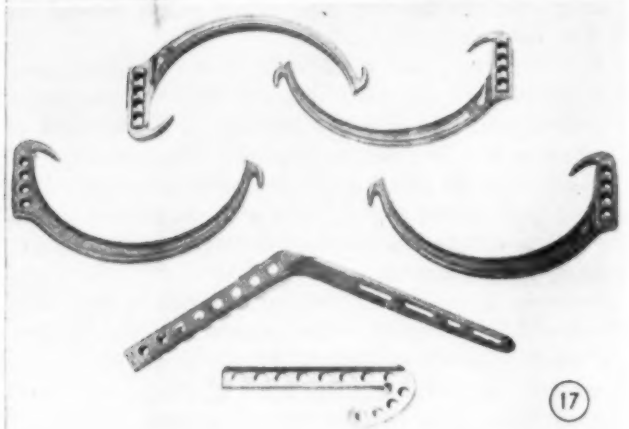
Fig. 15—Spray of test bars, cast to size, not to be machined before pulling, produced from metal melted in open flame furnace and containing 4.80 per cent silicon, 13.70 per cent zinc, remainder copper

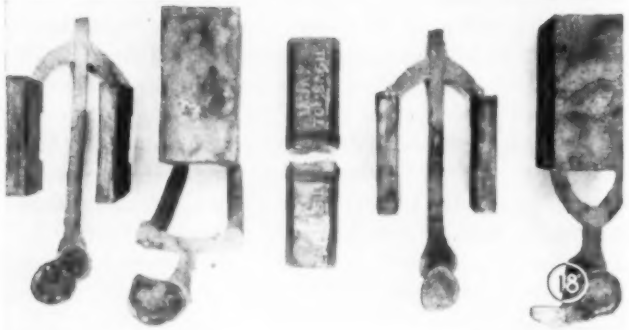
casting after sandblasting was perfect and it showed no sign of the defect sought.

A second pour, with metal at the normal pouring temperature of 1900 degrees Fahr., also failed to produce a defective casting. Deliberate overheating of the metal in the furnace was then resorted to, but with no success. In this instance the metal was moderately superheated to 2350 degrees Fahr., and removed from the furnace before allowing to cool to a temperature of 1900 degrees Fahr., at which point the casting was poured.

Subsequent experimental heats were run to determine effects of hard ramming; others to determine the effect of wet sand. All of them failed. Finally it was decided to superheat the metal excessively to approximately 2500 degrees Fahr. This resulted in the two defective castings shown in Fig. 16, one being a spray of test bars, the other the solid bushing under observation. Note that defects are similar in both castings. Before pouring these molds, the metal was allowed to cool to the normal pouring temperature of 1900 degrees Fahr.

Additional test bar molds were poured from this heat, along with the solid cylindrical casting. Upon removal from the sand, the castings gave every appearance of being satisfactory. It was not until after sandblasting that the defective areas seen in Fig. 16 were revealed. It was evident that sandblasting had disclosed the defect by removing some nonmetallic material from the surface. During the cooling period a peculiar phenomenon occurred. In all test bar molds a yellow powder formed on top of the risers. The color changed to white when cold which, of course, indicated formation of zinc oxide. Chemical analysis showed the powder contained 90 per cent zinc oxide and, significantly enough, about 10 per cent oxide of silicon. It therefore appears plainly evident that at the high temperature of superheat, namely, 2500 degrees





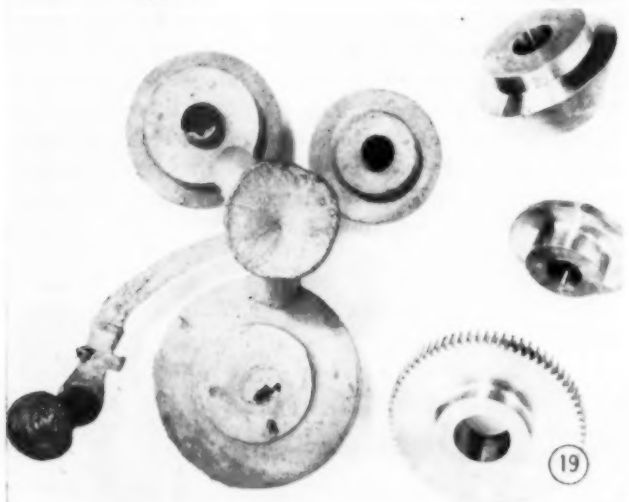


Fig. 16—Cylindrical castings and Webbert test blocks poured from overheated silicon bronze to show type of surface defect produced. Fig. 17—Types of eaves trough hangers made of silicon bronze. Fig. 18—Five test bars of silicon bronze alloy 46B28 (Ajax "Navy" Tombasil) with values as shown in above table. Fig. 19—Spray of gear castings. Oversize risers later reduced to find uncompensated shrinkage danger point

Five Test Bars of Silicon Bronze Alloy *

No.	Test Bar Type	Pouring Temperature, Deg. Fahr.	Tensile Strength, Lb. Per Sq. In.	Yield, Strength, Lb. Per Sq. In.	Elongation in 2 in., Per Cent	Reduction in 2 in., Per Cent
1	Webbert	1960	58,000	22,100	36.5	34.7
2	Wedge block	1950	55,000	19,950	29.0	31.2
3	Ingot (chill)	1940	62,800	22,400	34.0	32.1
4	†Webbert	1930	58,400	22,200	32.5	34.5†
5	Wedge block	1920	54,600	21,200	29.0	32.1

*Test bars all poured from the same crucible.
†Hardness test showed brinell number of 105.

Fahr., the silicon in the alloy became oxidized and produced the original defects shown. Further experiments may be suggested, but all indications point to oxidized metal as being the correct definition of the problem. Although the appearance of these defects differs somewhat from the surface of the specimen cut from the solid bushing, the defects represent virtual attainment of the original objective.

Notwithstanding the fact that silicon bronze alloys are not considered essentially bearing metals, it is interesting to observe in Fig. 12 a small bearing used on a large newspaper rotary press roll series. This bearing was made from ingot containing 4.80 per cent silicon, 13.70 per cent zinc, remainder copper. It is reported that this alloy has been used successfully for such bearings during the past 7 years, and that the original set of bearings still is in operation. Investigated further, it was disclosed that these bearings always have been very generously lubricated, and doubtless this is the factor contributing to such long service. As a result of this performance, 400 such bearings now are installed on new presses built for another larger newspaper plant. According to the foundrymen who produced the small bearings, "We did have one occasion where silicon bronze bearings froze to the shaft. This was when we made two large ring bearings for a rolling mill. We cautioned the engineer in charge to keep the bearings well lubricated with oil. Instead, they used a piece of mutton tallow, as had been their previous practice." This supports the assumption that very generous lubrication is necessary when attempting to use silicon bronze for bearings.

Silicon Bronze Resists Pressure

Fig. 13 shows a small elbow casting which is produced regularly by the same foundry, from the same silicon bronze alloy as the small bearing. This elbow is a high pressure part, and to date no less than 20,000 of these pressure castings have been made from silicon bronze.

The group of castings in Fig. 17 includes parts known as eaves trough hangers. These have been produced from silicon bronze for no less than 10 years past, and the alloy has replaced 85-5-5-5 metal previously in use for this class of work. Castings are made from ingot containing 4.80 per cent silicon, 13.70 per cent zinc, remainder copper. Poured in green sand molds, they demonstrate the superior casting properties of silicon bronze as compared with red brass for thin section castings.

In Fig. 19 appears a spray of gear castings, including some machined gears made from silicon bronze ingot containing 4.80 per cent silicon, (*Please turn to page* 162)

The Competitive Position of Gray Iron

By DONALD J. REESE, Chief
Manufacture & Foundry Products Section
Metallurgical & Conservation Branch
Steel Division, WPB, Washington

"I am not properly cataloged as a "Gray Iron Man" for I am governed by the simple premise of supporting the selection of the most suited engineering material and the most suited process of manufacture for every intended use to the end that American industry will produce the highest quality products at the lowest possible cost. It has been my privilege, however, to have had close associations with the gray iron industry for quite a few years, and my respect for the material—gray iron—has been increasing continuously. I am an optimist on gray iron as an engineering material to the extent that I have challenged young men to employ their talents in this industry, discouraged superintendents of gray iron foundries from thinking that other types of foundries offered more opportunity, and questioned some foundry executives, who have converted their foundries from gray iron to some other material, on the soundness of their venture."

THE foundry industry is an old industry, probably several thousand years old. The origin of cast iron is lost in antiquity. It has had a "Topsy" existence. The gray iron industry has been practically devoid of leadership throughout its history, and the fact that it has survived is a considerable tribute to the fundamental merits of the material.

We have learned more about this material in the past 25 or 30 years than was learned in its whole prior history, and there is little doubt in my mind but that its future progress will be at a continuously progressive rate. The industry's lack of leadership was recognized some 15 or so years ago when the Gray Iron Institute was formed, but it has only become a potent force in the past few years in the form of the Gray Iron Founders' Society. I do not wish to give you the impression that I am trying to sell the Gray Iron Founders' Society, but the future of the gray iron industry will be in proportion to the type of leadership evolved by the industry, and it is my impression that this society currently is the most potent force in the industry.

Foundry Process Shortest

We have not yet come to a full realization of the function of a gray iron foundry. Is not the foundry process of manufacture the shortest manufacturing route between raw materials and finished product? Is it not true that this process of manufacture requires the use of a minimum of raw materials and furnishes the consumer his requirements at the lowest over-all cost and in the shortest possible time? Different types of foundries use the same foundry process of manufacture to produce steel or bronze or magnesium or gray iron castings. To me, the engineering material processed in the foundry is incidental to the primary objective of the foundry industry, the utilization of the foundry process of manufacture.

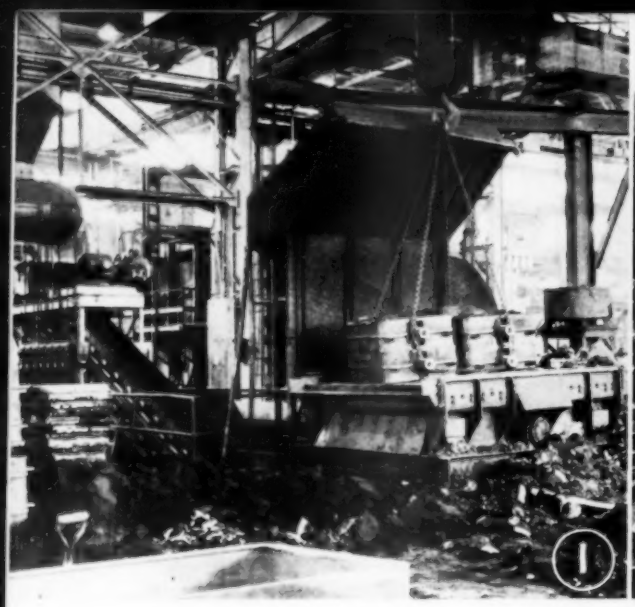
Most of the materials processed in the foundry industry also are processed by several other industries. How much do you think the consumer of aluminum, for example, would know about this engineering material if his sole source of information was a foundry or two making aluminum castings? If you think of all the materials —steel, malleable iron, gray iron, brass, bronze, aluminum, magnesium—processed in the foundry industry, you will realize ultimately that only one of these materials is processed solely by the foundry industry. That material is gray iron.

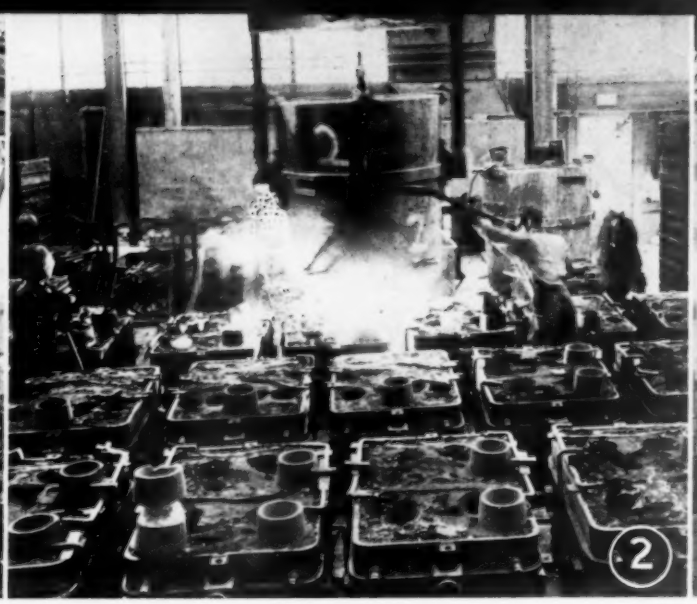
We in the gray iron industry have a two-fold job, a responsibility beyond that of other types of foundries or other industries in that we not only have to sell the foundry process of manufacture, but being the sole processor of the engineering material, gray iron, we are the only source of information on the material itself.

The foundry industry as a whole is not competitive within itself, but the various engineering materials are competitive. Competition between materials is one of competition between different industries rather than within any one industry. The future of the gray iron industry will be proportional to progress made by the whole foundry industry. If the foundry process of manufacture fails to produce a satisfactory casting of aluminum, don't be fooled into thinking that this failure does not have a negative influence on the welfare of the gray iron casting business.

It is startling to realize that we are the sole source of information on gray iron, but it points the way to the tremendous job we must do somehow if all of the consuming industry is to become informed adequately on the current merits of this material. As producers—how much do you really know about gray iron? As producers —how much do you know about your consumers' service requirements? As producers—how much have you done individually to inform the consuming industry about the material you are processing?

Gray iron is the most complex alloy in the whole family of iron and steel alloys. Relatively few people are well informed on this material, and when a producer knows too little about the material, the potential consumer is likely to know a great deal (*Please turn to page* 166)





MODERN DESIGN

Marks New Steel Foundry

AN EXTENSIVE program of plant expansion by the Symington-Gould Corp., Rochester, N. Y., designed to cope in some measure with war demands, includes a large new building devoted exclusively to the production of low alloy steel castings. The new building, 100 x 400 feet, erected on the corporation's extensive property several hundred yards south of the main group of old and new buildings, is designed and equipped in the most modern manner for coremaking, melting, pouring, shaking out, heat treating, cleaning, inspection and shipping. With a few minor exceptions, the movement of all material is steadily in one direction from the stock yard on the east to the shipping department on the west. The building was erected, equipped and is operated by the Symington-Gould Corp., as agent for the Defense Plant Corp.

Walls of the steel frame building are brick to a height of 8 feet. Remainder of the wall is steel and glass windows extending upward to an exceptionally high roof. Center section of the sash swings freely through an angle of 90 degrees and may be adjusted to any degree of opening consistent with proper ventilation under varying climatic and weather conditions. The motor-operated line shaft which actuates the sash is controlled through a push button device on one of the building columns. Light in the building, approximately equal to daylight on the outside, is secured through these windows and additional windows in the roof. This feature may be noted in several

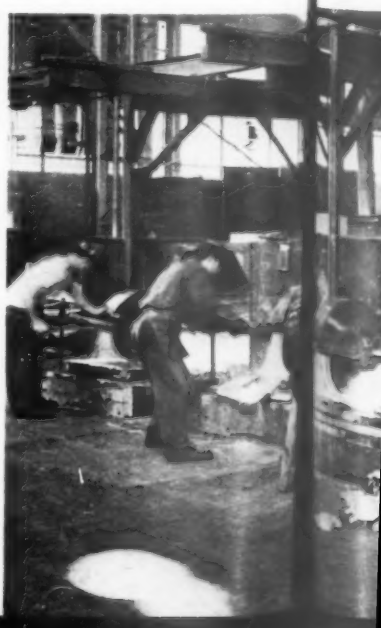


Fig. 1—Groups of flasks are lifted from the pouring floor and placed on a shakeout table. A powerful exhaust system removes steam and dust

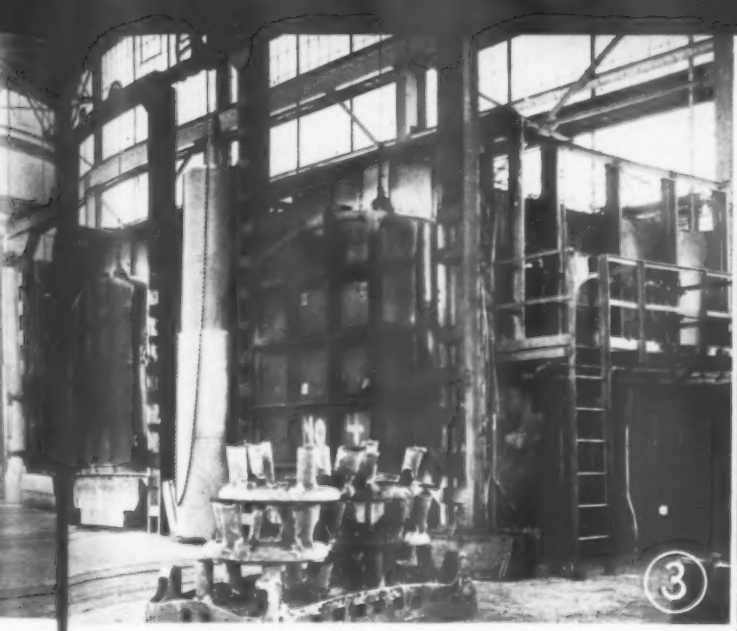
Fig. 2—The entire heat is tapped into a single ladle provided with a nozzle in the bottom. A lever on the outside controls the stopper rod which is moved up or down to open or close the nozzle opening

Fig. 3—Manganese alloy steel castings are subjected to heat treatment in a battery of car type furnaces. The quenching tank is not shown

Fig. 4—Castings in which minor defects are to be repaired by welding are preheated to a temperature between 300 and 400 degrees Fahr.

Fig. 5—Swing grinder operators work under hoods from which an exhaust system removes sparks, dust and grit

Fig. 6—The molding machine is located under a chute through which sand falls from a conveyor to fill the flask



By PAT DWYER
Engineering Editor
THE FOUNDRY

of the accompanying illustrations. The illustrations also show that the greater part of the floor area is paved with brick. Certain areas where trucks are used extensively are surfaced with cement. Records are kept on the behavior of the two materials, but sufficient time has not elapsed since they were laid to make intelligent comparison or draw conclusions. Up to the present, or time of writing, all the floors have given satisfactory service.

The building is divided longitudinally into two main bays. The north bay, served by three 5-ton capacity electric traveling cranes, contains the electric melting furnace, the mold setting up floors, shakeout station, heat treating furnaces and quenching tanks. The second bay houses the sand preparation equipment, the core room, two molding stations, chipping, grinding and casting cleaning departments. Shop office, and locker room are housed in rooms adjacent to and outside the building wall on the second bay. The main plant laboratory equipped to handle routine, research and special steel foundry problems, is located in one of the older, or main group of buildings, where it has functioned for many years. Laboratory analyses are speeded up by a 2-way vacuum tube system connecting plant *B* melting furnace with plant *A* laboratory. (*Please turn to page* 128)

JOB INSTRUCTION Promotes Safety

By WILLIAM CONOVER
Assistant Director
Training Within Industry
War Manpower Commission, Washington

THE subject of tieing in training of new employes with a general safety program is treated under four general headings. What job instruction really is, why it is basic to safety, how to make it produce results, the role of the safety supervisor in getting results. Real, solid job instruction is a rather loose, intangible thing in the minds of many people. According to the usual management philosophy, the management provides an opportunity for the worker to learn his job, and hopes that somehow he will catch on to it. Responsibility for learning is up to the worker. This process has been in use for many years and is still fairly prevalent.

Where the management exposes the worker to a job and hopes he will learn, the answer is up to the worker. He does not know how fast he should learn. What part of the job should he learn first? What parts must be watched with more than usual care? What will ruin the job? What will injure the worker? What factors or items in the process will make the job hard or awkward?

The most unfortunate point of all this and the crux of the problem is that the foregoing concept is grounded deeply in our thinking and habits. It takes an enormous amount of effort to get the management and through them, the works managers, superintendents and foremen, out of this and into a new groove. Under the new job training philosophy the management does not *hope* the worker will learn, but demands that he be trained. Responsibility is placed definitely on the supervisor. A date is set by which the supervisor must get the worker trained. To learn a job accurately and quickly, there is a simple and definite procedure, called a job breakdown. The supervisor breaks the job down into several small bites, each one small enough for the learner to master exactly and quickly. Then he takes each bite and picks out the important steps and key points. These are the points that may make or break the job, injure the worker, or make the work easier. A definite procedure is based on the four steps which were tried and developed in the yards of the Emergency Fleet Corp., during World War I.

Any worker of reasonable aptitude and ability, honestly and painstakingly instructed according to the four steps will do the job exactly right the first time, the second and tenth time, and come more nearly doing it exactly right for the remainder of his life than if he had learned in any other way. He will get up to production in about half the usual time, make less scrap than might be thought possible and stay free from injury either for a longer period than usual, or permanently. If the worker has not learned, the supervisor has not taught properly. This makes job instruction a mandatory part of the supervisor's job.

There is one right way to do every job. That is the production way, the quality way, the low cost and the safe way. Safety instruction should not be handled as a separate program. Safety is an integral part of any job. It is a matter of common knowledge that if the correct points are impressed on a worker's mind when he first tackles a new job, he is not likely to depart from that procedure at any subsequent time. Carelessness often is mistaken for lack of job instruction. Even today many foremen, safety directors, or boards of inquiry will assign carelessness, human failure or preoccupation as the cause of accidents. In many instances the verdict is correct, but in too many it is not accurate.

Experience of Training Within Industry on the problem of making job instruction show results has been nation wide. Experience gained in some 14,000 plants shows that the first and most essential step is to interest the top executive. His interest has to be enlisted to the point where he at least will call his executive staff to a meeting to consider the question. If the staff does not favor making job instruction part of the regular job of every executive and supervisor, the program should not be attempted. Job instruction that really gets results takes some time. Continued executive direction and interest is necessary to keep the program in operation.

Where the program is accepted, the president or operating vice president should announce the company policy and point out to members of the staff their responsibility in getting results. This is a vital feature. It shows whether job instruction is to be regarded merely as another flurry out of the personnel department, or a permanent part of operating practice.

First and second line supervisors should be trained to give effective instruction. With Training Within Industry this requires but 10 hours per group of 12 supervisors. Executive procedure should be established to see that the supervisors use the plan constantly and continuously. For example, this means that proper arrangement is made for the foremen to be given extra help and coaching, so that they can give the necessary supervision to their leading men, who in turn instruct the workers.

The role of the safety super- (*Please turn to page* 130)

An abstract of a paper presented before the National Safety Council's 32nd Annual Safety Congress

Gray Iron Founders' Society HOLDS REGIONAL CONFERENCES

NUMEROUS problems facing the gray iron foundry industry were discussed at two most successful regional management-marketing conferences held recently by the Gray Iron Founders' Society. The first conference was at the Hotel Statler, Boston, March 22, and the second at the Hotel Pennsylvania, New York, March 24. Attendance at each conference exceeded 125 gray iron foundrymen, and interest in the various presentations and discussions was exceptional. Most of the speakers appeared on both programs.

T. C. Weiser, Griffin Wheel Co., Chelsea, Mass., and president of the New England Foundrymens' Association opened the meeting at Boston. Edward C. Hoenicke, assistant to the general manager, Foundry Division, Eaton Mfg. Co., Detroit, and on loan to the government as acting head of the Gray Iron Castings Section of the War Production Board, outlined his impressions of the present problem in connection with gray cast iron in the war effort. He stated that few individuals, either in government or industry, have definite knowledge of gray iron castings as such, and that with the exception of certain interested buyers and engineers in industry who use gray cast iron, most people consider "gray iron castings" as material confined to use in such things as stoves, radiators, manhole covers and similar products. In contrast to this, according to Mr. Hoenicke, nothing in our entire manufacturing industry is possible without the use of gray iron castings.

Lack General Knowledge

As a result of this lack of knowledge of the gray iron foundry industry on the part of government, little consideration was given to that industry or its problems when the various departments and agencies of government were established. Mr. Hoenicke stated that he has had the opportunity to see the results of this situation, and that these results have not been helpful to the gray iron foundry industry. Many difficulties and misunderstandings, arise when people interested in gray iron endeavor to present their problems at Washington, since government employes usually do not have the technical background to understand the gray iron industry, and the average foundryman does not understand his government.

This situation is complicated further, according to Mr. Hoenicke, through the realization that the average gray iron foundry is a relatively small business, with 50 per cent of the firms doing less than $100,000 worth of business a year. The average employment in the gray iron foundry industry is approximately 100 employes per plant. These firms usually are operated by a single individual who, of necessity, takes care of all matters pertaining to the business, and it is most difficult for these men to find sufficient time to go to Washington to deal directly with the government. Mr. Hoenicke indicated that this situation stresses the importance of a national organization such as the Gray Iron Founders' Society, promoting the common interests of the entire industry and handling the many problems at Washington.

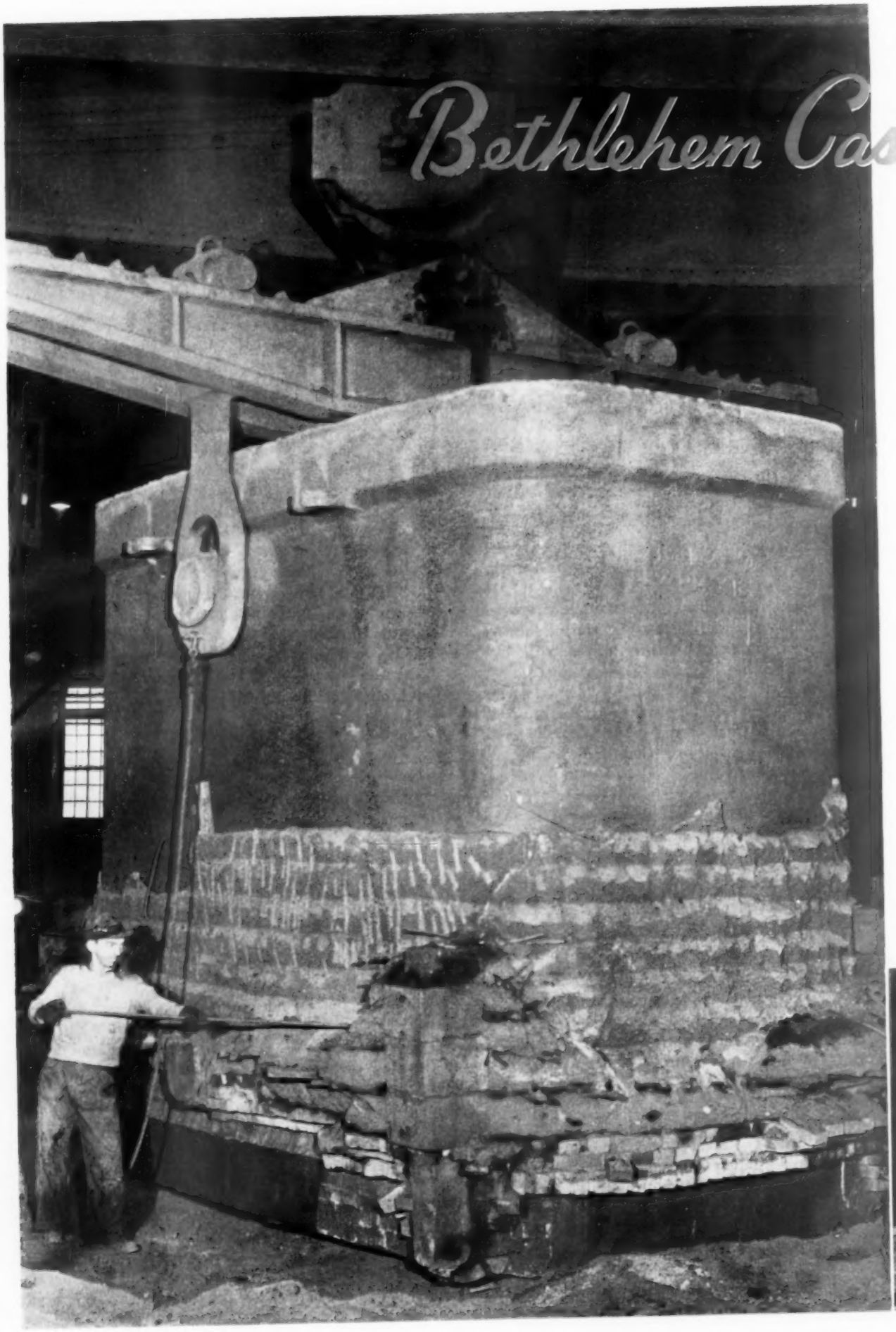
Mr. Hoenicke condemned the reluctance of most gray iron foundrymen to reveal information on operations or to have available complete and accurate records on their business. He pointed out that because of this inability to secure accurate data, government decisions have been made on known information, which at times has been meager and inaccurate. He also stressed the difficulties in making over-all government regulations for the entire industry, due to variations in business practices in different sections of the country.

Certain Features Lag Behind

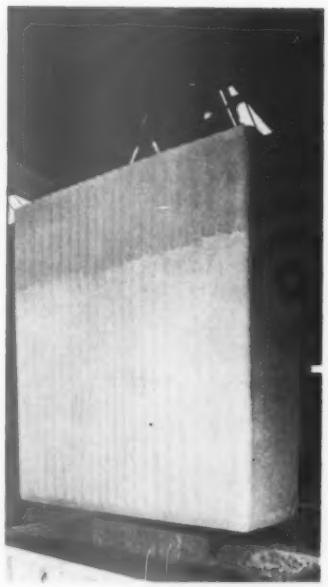
In closing Mr. Hoenicke stated that marketing, publicity and educational programs have not kept pace with great strides made in improved processes and metallurgical developments. Castings of extremely intricate design and possessing metallurgical characteristics undreamed of a few years ago are being produced in gray iron foundries. He indicated his belief that gray iron foundrymen possess strength, courage and determination to take advantage of these new developments when they again are available for commercial use.

Walter L. Seelbach, president of the Gray Iron Founders' Society, and secretary-treasurer of the Forest City Foundries Co., Cleveland, outlined in some detail his experiences as an industry member of the Fifth Regional War Labor Board. Mr. Seelbach stressed the importance of complete co-operation on the part of foundrymen with the industry members of the various Regional War Labor Boards.

John L. Carter, cost consultant, Gray Iron Founders' Society, presented an interesting paper "Sound Costing in the Gray Iron Industry" in which he stated that poor business management is responsible for low profits experienced in average years by the gray iron industry. Figures compiled through an Office of Price Administration survey indicates the industry's profits in 1936 to 1939 were only 4 per cent, and one-fourth of the companies operated at a loss. A comparison of the profit rates with reports of cost methods indicated clearly (*Please turn to page* 179)


Bethlehem Castin

...st Largest Ingot Mold



Dry sand core built on a lifting plate and reinforced on the inside with cast iron arbors spaced about 12 inches apart

THE corrugated one-piece ingot mold weighing 200 tons recently cast at the Bethlehem, Pa., plant of the Bethlehem Steel Co., is a record casting for the plant's iron foundry and probably is the largest and heaviest single piece iron ingot mold ever made. The casting is 9 feet 3 inches wide, 16 feet 7 inches in length and 13 feet 9 inches deep outside, and 5 feet 6 inches wide, 12 feet 10 inches in length and 13 feet 9 inches deep on the inside, which gives a wall thickness of 1 foot 10½ inches.

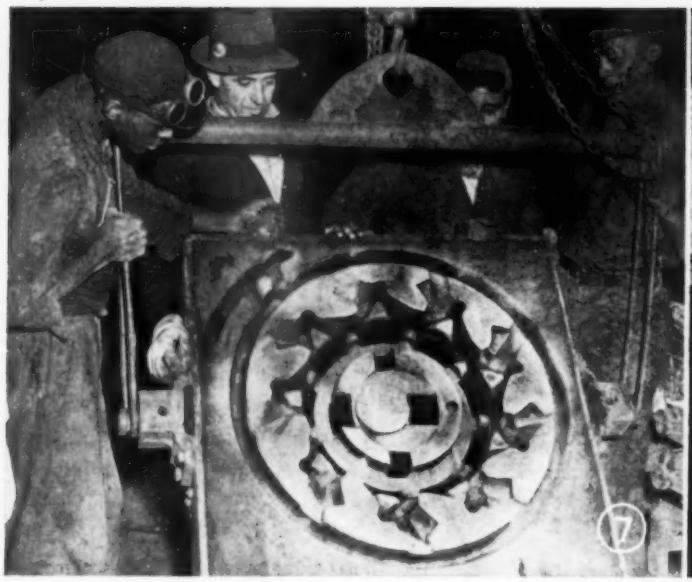
The mold was filled with metal from two 150-ton capacity submarine ladles and two regular foundry 15-ton ladles. About 250 tons of iron was used. The casting was stripped and cleaned 17 days later and was lifted out of the pouring pit. Casting and hoisting rig represented a total crane lift of approximately 220 tons. Rigorous inspection showed that the casting was perfect in every detail.

Several large concrete wall pits 18 x 20 x 22 feet deep in the foundry floor and lined with iron plates are available for molding all kind of large heavy castings. One of these was selected for making the mold for the ingot mold. Sand was rammed in the bottom to a height of 43 inches and covered by a bottom plate 6 inches thick to support the weight of mold, core and casting. Height of the sand bed was calculated to bring the top of the pouring basin flush with or a little below the floor level to accommodate the reservoir type of ladles filled with hot metal from the blast furnace. These ladles rotate on their axes and empty out at rail level.

A brick and loam face was swept off true and level on the foundation plate to form a seat for the pattern of box construction strongly braced longitudinally and laterally on the inside. The wall of the mold on the outside of the pattern to height of 30 inches was built of brick and loam. The remainder of the wall was faced with a dry sand mixture backed with sand from the floor, and rammed inside a cast iron curbing, which in turn was braced from the pit walls. Space between curbing and pit walls also was filled with rammed sand. The mold was dried with a gas burner.

The core was made in one piece supported on a heavy cast iron plate equipped with four lifting hooks. The plate was not machined, but was tapered on ends and sides to provide a 6-inch deep print to locate it accurately in a corresponding print formed in the bottom of the mold and thus insure the proper and uniform thickness of metal all around it. A special strong and refractory core sand mixture was used to form the core. Cinders were employed liberally on the inside (*Please turn to page* 178)

Ingot mold casting, 9 feet 3 inches wide, 16 feet 7 inches in length and 13 feet 9 inches high shown on the opposite page, weighs approximately 200 tons and recently was cast in the iron foundry of Bethlehem Steel Co. Below (left)—Casting loaded on a specially constructed underslung steel railroad car for shipment. Below (right)—Molding was done below floor level to accommodate the ladles which empty out at rail level



Produces Magnesium

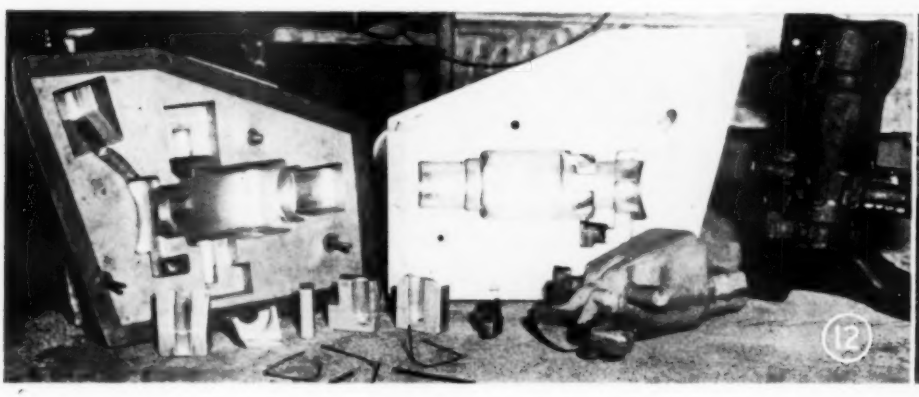
PART II

PRACTICE followed by the Utica Radiator Corp., Utica, N. Y., in the production of several types of magnesium alloy castings was presented in the April issue of THE FOUNDRY. Since procedures for making other types of magnesium castings and details on core production and sand handling are interesting, further details are given.

Figs. 7, 8 and 9 show the cope, cores and casting for a blower or supercharger housing for an airplane engine. Examination of Fig. 7 indicates that 13 risers are employed, and the casting is gated through a circular runner extending completely around the periphery. Flat, wide gates lead the metal from the runner along the cores forming the openings around the circumference of the castings. As may be observed, the sprue is in one corner of the mold, and opens into a short curved runner which extends somewhat beyond the two gate entrances into the circular runner. The extension acts as a pocket to catch any dirt or dross that might enter with the metal.

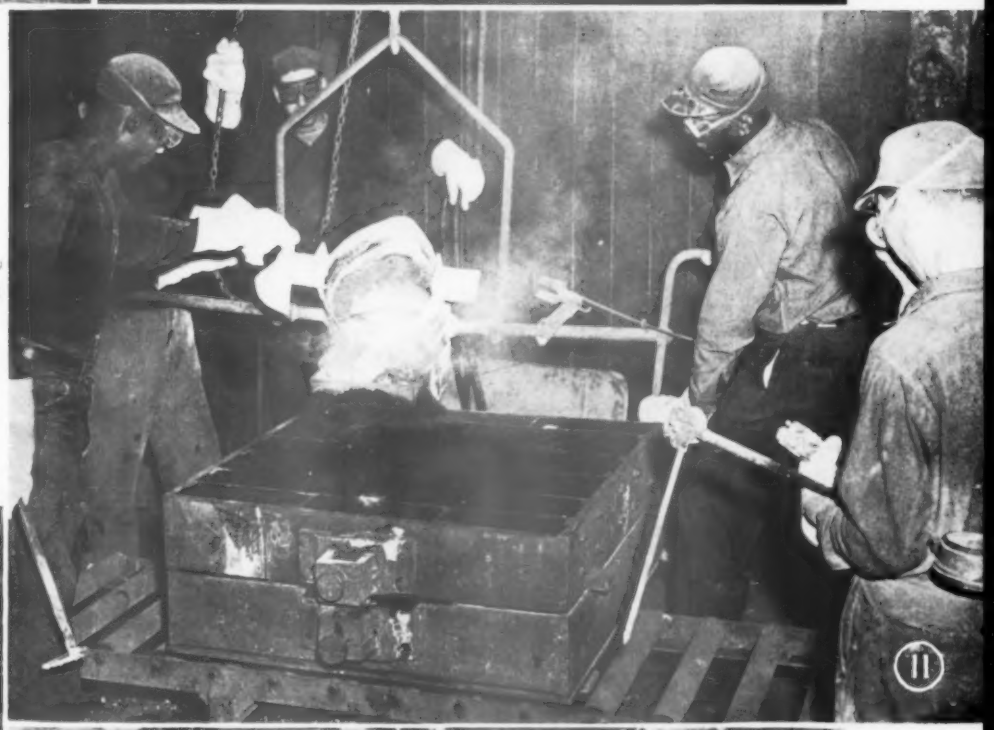
Cast iron basins or runner boxes are used in pouring all castings. These are used to prevent direct impingement of the molten metal on the sprue (*Please turn to page* 134)

Fig. 7—Cope for blower housing. Fig. 8—Core for the housing. Fig. 9—Removing excess metal from housing casting. Fig. 10—Previous to pouring the metal temperature is determined, and the pouring basin heated. Fig. 11—Pouring the mold. Fig. 12—Core boxes, loose pieces and dryer as well as finger core itself. Fig. 13—One of the 26 cores for rear crankcase casting. Fig. 14—Chipping castings. Fig. 15—Assembling cores



Castings

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY



X-Ray PROCESS ENGINEERING

By ROBERT TAYLOR

X-RAY inspection is not carried out entirely with the negative idea of rejecting work already done, but rather incorporates also the positive constructive idea of improving manufacturing processes, so that the causes of defective material may be eliminated.

Today specifications demand of contractors in many instances that their product be subjected to radiographic inspection. Processing radiographic inspection methods require a thorough understanding of radiography.

The first discovery in this country outlining the possibilities of x-ray as an inspection tool in industry began about 1923, when Dr. H. H. Lester of Watertown Arsenal made numerous tests on material specimens. The results of these studies were published by the American Society for Testing Materials in 1923.

This was followed by research work accomplished by the Naval Research Laboratory which brought about endorsement of radiography as an inspection method. Later, specifications issued by the Bureau of Ships were adopted in December, 1938, as section F1 of Appendix II, Metals, entitled "Definitions and Radiographic Requirements".

The American Society for Testing Materials in 1937 organized Committee E-7 on radiographic testing, with the hope that all advancements in this country in the technique of radiographic testing and the formation and adoption of radiographic standards would come to the attention of the committee for proper consideration.

The A.S.M.E. Boiler Code committee, the Bureau of Navigation and Steamboat Inspection, and the Army Air Force Material Command all have issued radiographic inspection specifications. The process of accomplishing radiographic inspection within the limits of existing specifications has become a major job.

Until recently, industrial radiography was used most extensively for examination of steel welds, castings and massive forgings. Subsequently, x-ray techniques were developed to reveal small defects in specimens of nearly uniform thickness. Exposure values were chosen to give a very high sensitivity with a uniform section of metal, where the range of thickness over which inspection was effective was small.

One of the latest applications of radiography has been in the aircraft industry. This became an entirely different problem in that seldom could there be found a casting of uniform shape and of the same thickness throughout.

Materials examined usually are light aluminum or magnesium alloys. This required a change in apparatus and accessory equipment because the materials were relatively easy to penetrate and also because it was necssary to examine a considerable volume per day. Therefore it was necessary to design apparatus wherein a volume of work could be turned out with a minimum of effort and time. In general, radiography was speeded up to meet the requirements of the war.

The Air Force Material Command issued two sets of specifications, the first outlining the method to be followed in the examination of class I and class II castings and the second relating to application for a certification test which is required in accordance with requirements of the Material Command. Having passed satisfactorily the certification test the x-ray inspection laboratory then proceeds with its work.

In short, the radiographic technique is the procedure of taking a radiograph with the best possible combination of factors so that minute discontinuities existing in a given specimen can be detected easily and readily. Characteristics of the x-radiation together with those of the film jointly are responsible for the success of the technique; the sequence of discussing the detailed characteristics of each should be chosen for convenience rather than for rank of importance as they are all of almost equal importance to the final result.

Vital consideration must be given to density, sensitivity, film, processing room and interpretation.

Equipment required for radiographic inspection of light alloy castings should have a kilovoltage range of from 30 kvp to 150 kvp.

Density of a film is the consequence of the dual radiographic processes consisting of (1) the exposure and (2) development of the film, and is spoken of radiographically as the logarithm of the reciprocal of the transparency of the film. Blackening then equals 1/T. In the examination of aircraft components a density of 2.0 to 2.5 is desirable.

Sensitivity of x-ray exposure is spoken of in terms of the ratio in per cent of the thickness of the thinnest cavity that can be detected to the thickness of the metal penetrated by the radiation, both thicknesses being measured in the direction of the propagation of the rays. For instance, a technique which can show the presence of a defect 0.015-inch thick in a casting 1-inch thick has a sensitivity of 1.5 per cent. In order to determine degree of sensitivity present, penetrameters are placed on the source side of the casting during radiography. Sensitivity of not less than 2 per cent is required for aluminum alloys and 3 per cent for magnesium alloys in accordance with existing specifications.

Film manufacturers have accomplished a notable achievement in producing ra- (*Please turn to page* 141)

Selecting Evaluating and Specifying METALLIC MATERIALS

Abstracted from a report
By H. W. GILLETT

Properties of bearing metal, material for high temperature applications, and writing of specifications are discussed in this fourth and concluding article.

BEARINGS are an outstanding case where "standard" tests, aimed to appraise the properties of *metals*, wholly fail to appraise those properties that really count in actual *bearings*. Nevertheless, bearing bronzes are still specified on the basis of the tensile properties at room temperature, determined on a test bar whose dimensions and rate of freezing on casting are unlike those of the bearing itself.

The compressive yield strength, or almost equally well, the hardness, at the bearing operating temperature is about the only property determinable by "standard" testing methods that has direct meaning. Even this falls down in the case of a lined bearing where the thin lining is supported by the stronger back, for compression tests of massive metal of the same composition as this thin lining do not reveal the resistance of the backed-up lining.

Tests need to be made on bearings themselves, and for bearing properties, with special equipment. Though this is obvious, laboratory tests on bearings have not developed to the point where they can be termed either standardized or accepted by engineers.

Because bearing failures are disastrous and little understood, engineers are inclined to regard bearings with awe and to be reluctant to make any changes in a workable design. Tradition largely governs design, to such an extent that substitution in the field of bearings is very difficult. Any tests, regardless of their soundness, are viewed with suspicion, and alternate bearing materials find it hard to obtain trial on the basis of test results.

Bearing tests, like those for corrosion and wear, must simulate the important features of service, and the type of failures produced in test must be the same type which is encountered in service.

Certain mechanical properties are needed in a bearing for fairly well understood reasons. Some of the features needed are an adequate compressive yield strength at operating temperature to resist squeezing out under the bearing load,[24] yet a yield strength low enough, if possible, to embed a grit particle. A low modulus of elasticity, so as to allow considerable elastic deflection back of a piece of grit, or to accommodate shaft deflection, may be an asset. Many bearing metals do have low elastic moduli. Fatigue resistance is needed for intermittently loaded bearings which often fail in fatigue. Cracking occurring on a lined bearing may be due to lack of fatigue resistance of the lining, or of imperfect bond between shell and lining. Notched-bar impact resistance might possibly be a feature in a very loose bearing with improper oil grooves, but the service does not allow deformation of the order produced in an impact test to fracture.

In unlined bearings, i.e. bushings, a copper - alloy matrix carrying lead pools, amounting to some 5 to 15 per cent lead, is the regulation material. These have high compressive strength as compared with the copper-lead linings of higher lead content, and can be cast easily with uniform distribution of the lead. The composition most used is 80 copper, 10 tin, 10 lead, though 85 copper, 5 tin, 5 zinc, 5 lead, often is found to serve. However, on the whole, too much zinc is considered to be detrimental to seizure properties, and a higher lead content than 5 per cent is pre- (*Please turn to page* 184)

Table III

Type	Copper %	Tin %	Lead %	Zinc %	Nickel %	Iron %	Aluminum %	Manganese %	Total other Elements %
7A	56-62	1½ max.	½-1½	bal.	....	2 max.	1½ max.	1½ max.	0.25
8A	56-59	½ max.	0.4 max.	bal.	½ max.	¾-1½	¾-1½	0.1-0.5	0.25
8B	61-63½	½ max.	0.1 max.	bal.	1 max.	2½-3½	4-6	3-4½	0.25

Questions and Answers

Wants To Use Tubes Instead of Cores in Thin Casting

Q.—Is there any information available on incorporation of steel or bronze tubes as an integral part of a bronze casting for the purpose of eliminating porosity and core sand in thin walled castings? In some instances the cored passages cannot be machined due to irregular or curved shape, but could be made easily in tubing.

A.—The practice of incorporating tubes or pipes in ferrous and nonferrous castings is not uncommon for forming passageways for steam, water, and oil. The essential feature is to see that the pipe or tube is absolutely clean so that there will be no kick back when the molten metal strikes it. In some cases the tube is filled with dry sand or a mixture of dry sand and sawdust while in others that procedure is not followed. With extremely thin walled tubing, use of sand might preserve the form of the passage in case of cut-through by the molten metal. However, that does not happen often, provided the entrance gates for the molten metal are so situated that the stream does not impinge on the tube for any length of time. Sometimes considerable skill must be exercised in supporting the tube so that it does not move or crawl from the desired position, but that trouble generally is encountered only with long pieces.

Difference in Appearance Due To Formation of Hot Spot

Q.—We are sending you a section from the base of a 6-inch hub where it merges with the face of a 20-inch blank gear, and a sketch to indicate the position. Dry sand cores surround the area in question. The metal used contains approximately 1.90 per cent silicon, 0.30 per cent phosphorus, 0.90 per cent manganese, and 3.40 per cent carbon. You will note that the fracture shows open iron at the edges where cooling is rapid, and close structure in the areas where cooling is slow. Can you offer any suggestions as to why the appearance of the fracture is such?

A.—Our first reaction to the sketch was that there was a hot spot and local shrinkage, not enough to cause actual porosity, but nevertheless a tendency in that direction. However, the fracture is coarse in some areas and dark and fine grained in others, much of the finer grain being toward the center of the section. Microscopic study did not reveal what we rather expected to find—actual microstructure was considerably more uniform than expected. Graphite is in very long thin flakes over most of the section. The difference in "fracture grain" appears to be due to the formation of large ferritic areas in some spots, pearlitic in others. It appears that the condition is somewhat similar to the condition which caused machine tool builders a lot of trouble a few years back, but that the graphite in ferrite is coarse rather than fine, the latter being a more usual condition in most other cases.

Some fine shrinkage is apparent, also a considerable amount of inclusions, largely sulphides. There is segregation in the area which leads to questions about gating. While certain details remain puzzling, the major trouble and its cure are clear. It is a hot spot at a re-entrant angle; the open grain is in part due to porosity and lack of feed, and the structure as a whole is microscopically coarse grained. The fracture is coarser where the ferrite offers little support, is finer where the pearlite is present although the graphite is not far different in the various areas. As to cure, some local chill blocks and attention to feeding should help the weak area.

Suggest Abrasive Cleaning For Nonferrous Castings

Q.—We are thinking of pickling our small nonferrous castings to obtain clean surfaces, and we would like to have some information on the procedure and materials to be used, such as material for vats, ventilation, acids, rinsing, etc.

A.—Stoneware vats will have to be used because nitric acid is one of the components. Since more or less fumes will be given off when the castings are pickled, ventilation will be required, and we suggest that you consult the factory or industrial code of your state and also those prepared by the Industrial Hygiene Committee of the A.F.A.

A number of solutions now employed for pickling or dipping nonferrous castings and a common one contains two parts sulphuric acid and one part nitric acid. Another contains two parts nitric and one part sulphuric, and sometimes a small amount of hydrochloric acid is added. Sometime ago a British journal reported that a practically fumeless dip for obtaining a bright color is composed of 65 gallons sulphuric acid, 20 gallons nitric acid, 100 pounds chromic acid, 1 gallon hydrochloric acid, and 120 gallons water. Most pickling solutions are used cold to prevent excessive pitting. Where solutions heat up too much from the reaction of acids and metal, the vats sometimes are cooled with water jackets.

Washing or rinsing after pickling or dipping may be accomplished with hot or cold water. We believe that hot water is more efficacious, and has the advantage of drying the castings quicker with less tendency toward stain. However, the first rinse could be in cold running water, followed by a hot rinse in a still hot water bath. To obtain economy in pickling it is advisable to allow the castings to drain over the pickle tank for a few seconds before rinsing. That means that there is a lower loss

in acids, and also less rinsing will be required.

Pickling of castings is rather a messy operation, and we wonder if you have investigated the possibilities of obtaining the desired cleanliness by use of mechanical blasting equipment.

Leaks in Valve Bodies May Be Due to Lack of Venting

Q.—We make valves from 1½ to 42 inches diameter and are experiencing considerable trouble from leakers in sizes from 4 to 8 inches. Analysis of the iron shows: Total carbon 3.50 per cent; silicon 1.72 per cent; manganese 0.67 per cent; phosphorus 0.38 per cent; sulphur 0.009 per cent. This metal has a tensile strength of 30,810 pounds per square inch and a transverse strength of 4320 pounds. The castings are sprayed with soapy water and subjected to 100 pounds per square inch air pressure. In some instances small bubbles are formed, while in others the only evidence of leakage is a small amount of foam. Is the temperature of the metal a factor? We have no way of checking the actual temperature, but from the ordinary, practical foundry view point, we consider it very hot.

A.—Under ordinary conditions, composition of the metal and pouring temperature are not important factors in the problem of leaky castings. In the present instance the analysis is that of a strong iron well adapted for use in valve bodies. As a preventative of cold shuts, trapped gas and other inclusions, hot metal is preferable to cold. From your description of the manner in which a small amount of compressed air oozes through the soapy water, it is apparent that the mold or core, or possibly both, and not the metal are responsible for the leaks. Lack of adequate venting in the pockets between the flanges, or lack of proper venting in the core, causes commotion in the metal.

If the iron remained fluid for a considerable period, this commotion would cease and the metal would settle into a compact mass. Unfortunately, molten metal, especially in thin or comparatively thin sections, solidifies rapidly with the result that the commotion areas solidify before all the steam or gas has been driven out. The metal in these areas is more or less porous. In extreme cases the bubbles formed by the gas are large and well defined. In other cases the gaps are microscopic where the metal has been agitated only mildly. Check up first on the cores to see that they are highly permeable, well dried and properly vented. See to it also that vent passages are provided between the core prints in the mold and the outside atmosphere.

Adhesive Materials in Sulphite Liquor Form Binding Agent

Q.—A recent issue of The Foundry referred to the use of sulphite liquor as a constituent of a silica wash for permanent molds. We would like to know just what sulphite liquor is, and where it may be purchased. We have been using a silica sand, bentonite, black wash, and are interested in trying this new wash.

A.—Sulphite liquor is a by-product obtained in the sulphite paper making process using pulp wood. Ground wood pulp is treated in digesters with steam and sulphurous acid, which breaks down and dissolves the intercellular materials such as resin, lignin, etc., leaving pure cellulose fiber. The sulphite liquor, containing as it does resins and lignins, forms a binding agent, and for years it has been used to some extent in the foundry industry as a core binder, and in blackings and washes. In some cases the water is evaporated from the liquor to form sulphite pitch or resin which is sold in powder form. Addition of water to the powder brings it back to the original form. Sulphite liquor or powder may be obtained from a number of sources whose names and addresses are available in the advertising pages of The Foundry.

Numerous Factors Are Involved In the Blowing of Cores

Q.—Can you give us information on what would be the best sand mixture for blowing a cylinder head jacket core? This core contains several blind recesses that cannot be brought directly under the blowholes, due to the contour of the upper half of the box.

A.—As you undoubtedly know, numerous factors must be considered in addition to the sand mixture in blowing cores. Size of the blowing holes and their location, as well as the vent holes, are important—probably more so than the sand. We can only offer a suggestion on a suitable mixture, and one used is compounded with 1.8 to 2.2 per cent moisture, 1 part cereal bond to 25 to 50 parts of sand, 1 part core oil to 60 to 80 parts sand, and 2 per cent iron oxide. Compare that with your present mixture, and try variations of it to meet your conditions. Keep the moisture on the low side if possible. Several typical sand mixtures for core blowers are given in "Modern Core Practices and Theories" by Harry W. Dietert.

GANGWAY!

By J. A. Patterson

"They tell me the company had to make a pretty stiff bargain before he'd even take a job."

Wood Patterns Swell And Contract

Q.—Have you any data on contraction and expansion of pine and other woods used in the construction of patterns? Does pattern pine go and come on the length or with the grain?

A.—The foregoing and other points were discussed by E. T. Kindt in a paper at an annual A.F.A. convention and which was published in condensed form in the March 1943 issue of THE FOUNDRY. The author pointed out that variation in the moisture content causes the wood either to swell or contract. For example a 12-inch flat grain pine board will shrink 1/16-inch where the moisture content is reduced from 12 to 7 per cent. Wood shrinks most in the direction of the annual growth ring tangentially, commonly called flat grain, and about half to two-thirds as much across these rings called edge grain. Practically no shrinkage or expansion takes place longitudinally except where a board is excessively cross grained. Lengthwise shrinkage is a combination of crosswise and longitudinal change. The percentage of moisture content recommended for either pine or mahogany is selected for the purpose of reducing changes in moisture content to a minimum, thereby minimizing dimensional change after the patterns and core-boxes are placed in service or put away in storage. Too little attention is paid to moisture content of lumber and the relative humidity in patternshops and pattern vaults which in the majority of instances are not air conditioned.

Wet Sand Cause of Rough Castings

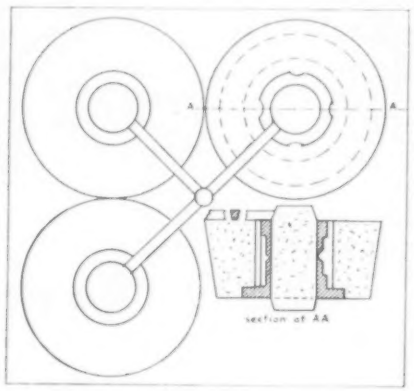
Q.—We are making high pressure bronze castings in weight up to 25 pounds. Our sand is a mixture of No. 0 and 2½ Albany. We carefully refrain from using hot sand over the patterns, but occasionally the castings are rough and scabby. Average sand properties from five heaps show: Moisture content 7.12 per cent, permeability 8, compression strength 4.86 pounds, shear strength 1.2 pounds.

A.—The usual cause of rough surface on bronze castings is excessive moisture, low permeability or hard ramming, or a combination of all three. The high moisture content may not extend through the entire heap. It is the result of sand cut over by hand by operators who are either incompetent or careless. In the present instance the moisture content is uniformly too high. It should not exceed 6 per cent, and more particularly it should be uniform throughout the heap. Low permeability may result from the use of new sand in which the clay bond is too high, or from the continued use of old sand in which the grains have broken down to form silt.

Sand with a clay content of 15 to 20 per cent is suitable for small or very fine castings. For medium weight and heavy castings the clay content may lie between 10 and 15 per cent. Permeability should not be less than 10 according to standard A.F.A. methods for fine castings and not less than 15 for medium and heavy castings. Constant attention is necessary to maintain the sand in proper condition. Wet spots and dry spots are responsible for many defective castings. A minimum amount of equipment is needed to determine the moisture content of sand. The operation requires but a few minutes and should be performed regularly.

Shrink Appears in Small Casting

Q.—We are forwarding a small but chunky gray iron casting 4½ inches diameter, 4 inches in length, with a 6-inch diameter flange at one end, and a 2⅝-inch diameter hole through the center. Due to several indentations on the outside, the pattern is split through the center and molded half in the cope and half in the drag, four patterns to a flask. A small shrinkage area appears on top at the junction of the flange and body. Castings must conform to the following specifications: Minimum



Castings are poured on end

tensile strength 29,000 pounds per square inch, maximum total carbon 3.50 per cent, maximum combined carbon 0.70 per cent, maximum sulphur 0.175 per cent, silicon 2.50 per cent, manganese 0.60-0.75 per cent, phosphorus 0.30 per cent, chromium 0.15 per cent. Each casting is poured through a single small gate close to the center core in the drag side of the flange end.

A.—Any one of several remedial measures might be applied if the size of the order or other local conditions force you to continue using the present pattern and flask equipment. 1—Use the present gating method, and place a small chill in the sand at the shrinkage point. A cope 3 inches deeper than the flange on the pattern is deep enough so far as the mold is concerned. However, the sprue should be raised an additional 3 inches in a suitable cup or pouring basin. 2—Use a 3-inch diameter sprue in the center between the four patterns to serve as a combined sprue and feeder. Attach the gate to each pattern in the cope instead of in the drag as at present. Enlarge the gate to a size 1 x 1½ inches. 3—The same style gates may be attached to the usual or present size sprue. The casting will be fed through a 2-inch diameter riser, necked down to 1-inch in the center of the top side of the casting.

The foregoing are remedial measures and will produce castings clean and solid on the outside. They are not guaranteed to produce a perfectly flawless structure on the inside. The proper method of solving the problem is to make a new set of patterns, to be molded on end, flange side down. The patterns are plain cylindrical blocks, and the indented vertical walls of the casting are formed by properly shaped ring cores placed in the circular mold cavities. The mold is covered with a plain, flat cope 5 or 6 inches deep with an ordinary sprue in the center and with a tapered gate extending over the top of each pattern. With this arrangement the entire casting is in the drag and all the metal enters at the top, the ideal combination for directional solidification from the bottom upward.

Small Ring Swells On Both Sides

Q.—We are making a flange casting 6½ inches in diameter with two patterns on a plate. The mold is made in a flask 10 x 20 inches which provides 2⅝-inches of sand between pattern and flask at the ends and 1¾ inches at the sides. Each pattern is out of round ⅛-inch so that the casting may be cut in two, machined as a unit and then assembled with a spring around the outside to hold the halves together. On the pattern, the grooves which act as a guide for the saw cut are parallel to the sides of the flask. The castings are true to pattern in this direction, but on the other diameter, that is in the direction of the flask sides, the castings come ⅛ and sometimes ¼-inch in excess of the proper size. The molds are made in a straight side snap flask and are enclosed in straight side slip jackets 5 inches high before they are poured. The castings are shaken out while still at a cherry red heat. We shall appreciate your opinion on the cause of the trouble, and your advice on the proper preventive measure.

A.—This is one of the comparatively few cases where no crystal gazing is necessary to diagnose the cause and to point out the proper method of prevention. The mold is almost, but not quite strong enough to resist the static pressure and weight of the metal in the castings. The mold yields slightly and the result is an over-size casting. The mold does not yield at the ends because the sand walls are thicker than they are at the sides. In addition to the thin walls, a slip jacket pushed down over a sraight face mold does not hug the sand tightly enough. You have the choice of three remedial measures. One is to make and pour the mold in a solid flask. The second is to place a band inside the snap flask. The third is to make the molds in a tapered snap flask and enclose them in tight fitting tapered slip jackets. Any one of these measures will prevent the castings from swelling.

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THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

Pipe Cast Vertical Or Horizontal

Q.—In our small gray iron foundry we make miscellaneous castings including soil pipe and other sanitary appliances. We shall appreciate information on how aqueduct pipes are made in United States foundries. We have been given to understand that the method is different to that employed in the manufacture of soil pipe.

A.—The term aqueduct in your letter and in our translation presumably refers to cast iron pipe employed in the transportation of water under pressure. The same type of pipe also is used for transportation of practically all kinds of gases and liquids. Up until about 1920 all the pipe in diameters up to 72 inches, and in 12, 14, 16 and 18-foot lengths was molded and cast vertically in pits. The molds were dry sand in iron flasks and the cores were loam swept on a barrel covered with hay rope.

In recent years the centrifugal process has been adopted widely. Metal is poured into rapidly revolving molds and assumes the shape of the pipe without the use of cores. At present it is claimed that approximately 75 per cent of all cast iron pressure pipe in sizes 36 inches diameter and under, are made by the centrifugal method in this country. In one method the bare metal molds are water cooled and the resulting pipes are annealed afterward to neutralize the surface chill. In the second method the metal molds are lined with sand. In the event you have a back file, or have access to a back file, a comprehensive series of articles dealing with every method of making cast iron pipe, appeared in THE FOUNDRY from March 1, 1930 to June 15, 1931. Pipe making by any method is a highly specialized branch of the foundry industry and involves large initial capital expenditure, only capable of being amortized over a considerable period by large output.

Find Melting Speed Of the Cupola

Q.—We are going to start continuous melting again in a cupola that has not been in use for the past 10 years. We shall appreciate information on the melting capacity and on any other features that may be of assistance in getting it ready for use. The cupola is 30 feet high, 54 inches diameter, fire brick lined, mounted on cast iron legs 6 feet high resting on a concrete foundation.

A.—The only factor required in estimating the melting capacity of a cupola is the diameter inside the lining at the melting zone. Total height of the stack is immaterial since a cupola 10 feet high will melt as fast as one 40 feet in height. Diameter of the shell also may be ignored, since the lining in individual instances may vary from 4 to 12 inches. Melting speed depends on the volume of material concentrated in the melting zone, and therefore, subjected to the maximum temperature. Development of maximum temperature depends on how efficiently the cupola is operated, that is the balance maintained between the weight of the descending charges of coke and iron, and the amount of air supplied by the blower.

Under favorable conditions it has been found that a cupola will melt approximately 10 pounds of iron per hour for every square inch of horizontal area at the melting zone. Obviously this measurement is taken inside the lining and not inside the shell. For example, a cupola 54 inches diameter inside the lining has a melting speed of 54 x 54 x 0.7854 x 10 = 22,902 pounds per hour. For a complete treatise on the subject of cupola history, construction, operation and maintenance we suggest a study of *Melting Iron in the Cupola* by J. E. Hurst, published by the Penton Publishing Co., Cleveland.

Pour Metal Through Staggered Gate

Q.—We shall appreciate your opinion on the best method of gating a circular casting 10 feet deep and 20 feet in diameter molded in a pit in the floor.

A.—The best method, also the actual size, shape and position of the sprues and gates, depend to some extent on the thickness of casting section, and on the total weight of the casting. In certain instances the problem is complicated further by lack of adequate crane and ladle capacity. Assuming that this feature is not present in this instance, some foundrymen prefer to pour the metal through a ring of pop gates on the top, while other men prefer to introduce the metal through a number of staggered gates either inside or outside the vertical wall. Whichever method is used, the metal first is poured into a circular basin which feeds all the sprues if only one ladle is employed. If two cranes and two ladles are available the basin may or may not be continuous.

Presumably a mold of that size and shape would be either dry sand or loam and therefore would be strong and refractory enough to prevent any erosion from streams and metal poured in at the top. From a theoretical standpoint the method is commendable since the hottest metal always would be on top as it advanced upward in the mold, and therefore, would promote directional solidification. Where the second method is employed, a group of three sprues is set up at three equidistant points around the circumference either on the inside or the outside. One sprue extends to the bottom of the mold, one extends to a point approximately half way down, and the third a short distance below the top.

A suitable size gate leads from the bottom of each sprue into the mold cavity and each sprue is fed from the basin above the cope. All sprues are plugged until the basin is filled with metal. Three plugs are lifted to allow a calculated amount of metal to enter the mold through the bottom gates. Then the plugs are lifted out of the middle distance sprues, and finally the third set of plugs are lifted to allow the latest metal to enter the mold through the gates near or at the joint line.

What Is Brass and What Is Bronze

Q.—How do you distinguish between brass and bronze? There seems to be considerable confusion in the use of the terms. Alloys almost identical in composition often are referred to by different names.

A.—National Bureau of Standards in Letter Circular 487 of Jan. 18, 1937 offers the following comment: The first bronze was essentially an alloy of copper and tin. Brass was an alloy of copper and zinc. However, it soon was found that the addition of other metals to the simple binary copper-tin alloy often resulted in a material with improved properties, such as strength, corrosion resistance or more pleasing appearance. Consequently, many of our nominal copper-tin alloys contain tin and zinc and sometimes other metals. In these alloys it is often difficult to determine whether the zinc or the tin has a predominating effect.

The decision cannot be based on the numerical percentages of the two, since a given amount of tin usually has more effect than an equal percentage of zinc. With increasing complexity in the composition of the alloys, it becomes increasingly difficult to determine whether a given alloy should be called a brass or a bronze. In cases where a distinction between brass and bronze could be made, there has been no great misuse of the term brass, except that in railroad engineering parlance any kind of a bearing often is called a *brass*, referring to the bearing rather than to the alloy of which it is made. Mis-applications of the term bronze frequently are encountered. Bronze generally has been accepted as being superior in a number of ways to brass and advantage of this fact was taken in applying the term bronze to newly developed alloys.

The term bronze has been applied to so many copper alloys that the simple alloys of copper with tin often are referred to as tin bronzes. Until some better classification is devised the American Society of Testing Materials, Committee B-5 on Copper Alloys, Cast and Wrought has adopted a tentative standard B-119-39 T. This classification is based on the use of the term bronze for copper base alloys, of less than 98 per cent copper, containing alloying elements other than zinc. Zinc may be present in amounts insufficient to make its effect predominant on the properties of the alloy. Brass is the term applied to copper base alloys of copper, in amounts less than 98 per cent, with zinc. These alloys may be modified by additions of other elements in such small quantities that their effect on the properties is subordinate to that of zinc. While it is regretable that the terms brass and bronze cannot be pinned down definitely, the point is relatively unimportant.

Next to Correct Hopper Design . . .

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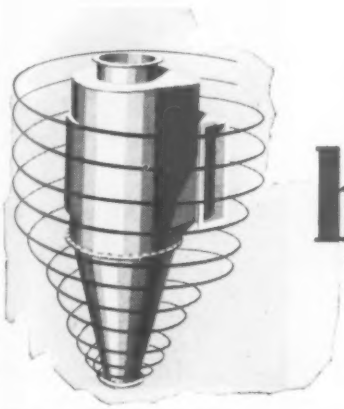

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DUST RECOVERY SYSTEMS

BUELL FEATURES	RESULT IN	PRODUCE
SHAVE-OFF LARGE DIAMETERS	HIGH COLLECTION EFFICIENCY	GREATER RECOVERY
EXTRA-THICK METAL	LESS FAN BLADE WEAR	LOW MAINTENANCE
LARGE OUTLETS	LOW DRAFT LOSS	LOW OPERATING COST
INNER WELDS GROUND SMOOTH	LOW POWER CONSUMPTION	LONG LIFE
CORRECTLY DESIGNED HOPPERS	HIGH TEMPERATURE RESISTANCE	NO CLOGGING
SPLIT-DUCT MANIFOLDS	UNLIMITED CAPACITY	
	NO MOVING PARTS	
	FREE DUST FLOW	

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

MEN ... of Industry

FRANK W. SHIPLEY has been appointed assistant factory manager of the Foundry Division, Caterpillar Tractor Co., Peoria, Ill. Mr. Shipley was born in Disko, Ind., received his early education in Rochester, Ind., and was graduated from Purdue University in 1921 with a degree in chemical engineering. He spent several years in the chemical laboratory of the Studebaker Corp., South Bend, Ind., and later was transferred to the foundry. Subsequently he became foundry metallurgist at Lakey Foundry & Machine Co., Muskegon, Mich., and also at Fairbanks, Morse & Co., Beloit, Wis. Mr. Shipley joined Caterpillar in 1929, serving as foundry metallurgist and later as general superintendent until his recent promotion.

♦ ♦ ♦

C. F. Nagel Jr., chief metallurgist of the fabricating division of the Aluminum Co. of America, has been appointed chief metallurgist of the company, and will head a newly-created metallurgical division. **H. J. Rowe,** manager of the general technical laboratory of the company's castings division in Cleveland, has been promoted to chief metallurgist of the division, with headquarters in Pittsburgh. **T. W. Bossert,** for the past 9 years assistant chief metallurgist of the fabricating division, succeeds Mr. Nagel as chief of the division.

♦ ♦ ♦

Tom E. Barlow, recently foundry engineer with the Vanadium Corp. of America at Detroit, has been appointed to the research staff of the Battelle Memorial Institute, Columbus, O., where he will take an active part in the research program being conducted for the Gray Iron Research Institute. Mr. Barlow was graduated from the University of Michigan in 1935, and became associated with the Ecorse Foundry, Detroit. In 1936 he joined the Battelle staff, engaging for several years in research to determine effect of certain melting factors on quality of gray iron and in studying effect of copper in cast iron. With the inauguration of the program by the Copper, Iron and Steel Development Association to apply the results of research to commercial practice, Mr. Barlow became field engineer for that organization. He joined Vanadium Corp. of America in 1940. Mr. Barlow is chairman of the American Foundrymen's Association's Gray Iron Division Committee on Chill Tests, also of the Subcommittee on Inoculated Iron.

♦ ♦ ♦

Robert B. Reed has resigned as sales manager of Young Bros. Co., Detroit, following an association with the company since 1914, and he has been succeeded by **Richard J. Ruff.** Mr. Ruff was graduated from the University of Wisconsin in 1933, and has been identified with the sales department of Young Bros. for the past 7 years.

♦ ♦ ♦

J. P. Wright, general manager of sales, Western Foundry Co., Chicago, has been elected vice president in charge of sales, and **Frank D. O'Neil,** formerly treasurer, has been made vice president in charge of manufacturing. Other promotions include **L. W. Austin,** from secretary to treasurer, **J. D. Nigh** from assistant secretary to secretary, and **J. O. A. Johnson** to assistant secretary and assistant treasurer.

♦ ♦ ♦

John F. Robb has been appointed manager of the Pittsburgh district of the Climax Molybdenum Co., New York. Graduated from Pennsylvania State College in metallurgical engineering in 1927, Mr. Robb was connected successively with the Carpenter Steel Co., the Birdsboro Steel Foundry & Machine Co., the Pittsburgh Crucible Steel Co. and the Brighton Electric Steel Casting Co. He joined the Climax technical staff in 1935 in the Pittsburgh office.

♦ ♦ ♦

Dr. Samuel L. Hoyt, technical adviser, Battelle Memorial Institute, Columbus, O., has been selected by the Golden Gate Chapter of the American Society for Metals to present its 1944 educational lectures. The lectures, on the subject, "Properties, Selection, and Specification of Alloys," will be given at the University of California on April 19 to 25.

♦ ♦ ♦

Dr. Scott W. Smith, physicist, Kelley-Koett Mfg. Co., Covington, Ky., has been appointed a member of an advisory committee formed by the War Metallurgy Committee of the National Academy of Sciences and the National Research Council to conduct research in the field of fluoroscopy of metallic materials.

♦ ♦ ♦

William C. Johnson, general sales manager of Allis-Chalmers Mfg. Co., Milwaukee, has been elected a vice president of the company. Mr. Johnson has been with the company since 1924, and succeeded **Walter Geist,** now president, as general sales manager in 1942. **James M. White,** since 1942 works manager of Allis-Chal-

(*Continued on page* 84)

FRANK W. SHIPLEY

C. F. NAGEL JR.

HOWARD J. ROWE

TOM E. BARLOW

An Important

ANNOUNCEMENT

to ALL Merchant Pig Iron Users

REMOVAL of allocations on merchant iron deliveries makes it possible for us to extend our service to many customers whom we have been unable to supply these past two years because of WPB restrictions.

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WOODWARD IRON COMPANY

WOODWARD, ALABAMA

INDEPENDENT SINCE 1883

(*Continued from page* 82)

mers, also has been elected a vice president. Associated with the company since 1929, at one time he was manager of the La Porte, Ind., works and later assistant works manager at Milwaukee. A third new vice president is **William A. Roberts,** since 1941 manager of the Allis-Chalmers tractor division.

♦ ♦ ♦

Dr. V. N. Krivobok has joined the Development and Research Division of the International Nickel Co. at New York. Previously he had been chief metallurgist of the Lockheed Aircraft Corp., Burbank, Calif. Before joining Lockheed in 1941 Dr. Krivobok had been professor of metallurgy at Carnegie Institute of Technology since 1924. He also served as associate director of research for the Allegheny Ludlum Steel Corp. from 1934 to 1940, and during the preceding 10 years had been consulting metallurgist to several steel companies.

♦ ♦ ♦

E. W. Potratz has been appointed manager of the Hoist Sales Division, Harnischfeger Corp., Milwaukee. Mr. Potratz joined the division in 1935 as an estimator, and in 1939 was named assistant sales manager. Since 1942, because of the protracted illness of George Drake, he had served as acting sales manager.

♦ ♦ ♦

Robert S. Archer has joined the Climax Molybdenum Co., New York, as metallurgical assistant to the vice president. Recently he had been chief metallurgist of the Chicago district of the Republic Steel Corp. Mr. Archer was graduated from the University of Michigan in 1916, and during the last war was with the metallurgical laboratory of the Bureau of Aircraft Production in Detroit. Joining the Aluminum Co. of America in 1919, he was research chemist with the Cleveland section of the Aluminum Research Laboratories until 1930 when he went to the A. O. Smith Corp., Milwaukee, as director of metallurgy. Mr. Archer had been with Republic Steel Corp. at Chicago since 1934.

♦ ♦ ♦

Ralph F. Merriam has been appointed purchasing agent for the Cleveland Cooperative Stove Co. and its divisions, Grand Home Appliance Co. and Cleveland Foundry Co., Cleveland. He succeeds **Victor H. Gordon,** now with the U. S. Army. Mr. Merriam has spent the past 9 years with Grand Home Appliance Co., serving 7 years as district manager of the Ohio and Pennsylvania territory and the last two as assistant purchasing agent.

♦ ♦ ♦

Henry F. DeBardeleben has been elected executive vice president and general manager of the DeBardeleben Coal Corp., Birmingham, Ala. Mr. DeBardeleben, who formerly was vice president in charge of marine operations, will continue to make his headquarters in New Orleans. Other new officers of the company include Alvin W. Vogtle, vice president, traffic and sales; John W. Crawford, secretary-treasurer, and Joe M. Goodwin, assistant secretary-treasurer. Other officers have been re-elected.

♦ ♦ ♦

William D. Turnbull has been appointed manager of the agency and specialties department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Turnbull recently was vice president and sales manager of the Pomona Pump Co. of California, which he joined in 1940. Previously he had been associated for 17 years with the Westinghouse sales department.

♦ ♦ ♦

J. K. Gannett, vice president of the Austin Co., Cleveland, and its eastern district manager since 1928, has been appointed director of engineering, in charge of engineering and research.

♦ ♦ ♦

Dr. William A. Pennington has been appointed to the research staff of the Carrier Corp., Syracuse, N. Y. For the past 4 years Dr. Pennington had been associated with the Mellon Institute, Pittsburgh, specializing in the field of physical chemistry as applied to metallurgical developments. Previously he had been with the research department of the American Rolling Mill Co.

♦ ♦ ♦

George Spatta, executive vice president and general manager of the Clark Equipment Co., Buchanan, Mich., recently was honored by the National Association of Foremen, which presented him a plaque bearing the association's honor roll to which Mr. Spatta's name has been added. The award was in recognition of "meritorious service" to the association and in appreciation of constructive work done by Clark Equipment Co. foreman during the past year.

♦ ♦ ♦

Samuel L. Case, formerly technical advisor, Jones & Laughlin Steel Corp., Pittsburgh, has joined the Battelle Memorial Institute, Columbus, O., as a research metallurgist. Mr. Case received his technical education at the Polytechnic School, Kiev, Russia.

♦ ♦ ♦

Benjamin Van Horn has retired after 47 years' association with Harnischfeger Corp., Milwaukee. Joining the company as a stenographer in 1896, he advanced into crane sales work and rose to the position of sales manager of that division.

♦ ♦ ♦

Stanley L. Burgess has been appointed sales representative in the Detroit territory for the Stearns Magnetic Mfg. Co., Milwaukee. Mr. Burgess held this position before joining the Army Air Forces in 1941, and has been reappointed since receiving his honorable discharge.

♦ ♦ ♦

Roger F. Waindle, chief of the production section, tank and automotive branch, Chicago Ordnance District, has been released to The Alloy Casting Co.,

(*Concluded on page* 86)

DR. V. N. KRIVOBOK

E. W. POTRATZ

ROBERT S. ARCHER

RALPH F. MERRIAM

THE LAST DROP IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

The Proof of The Pudding!

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STEEL CORE AND MOLD WASHES • BINDER AND CORE PASTE • CORE WASHES • CHILL COATINGS

(*Concluded from page* 84)

Champaign, Ill., engineers and manufacturer of furnace mechanisms and heat-resisting alloy castings, to become general manager and chief engineer. He succeeds L. M. Lindsey, who becomes co-manager of the Detroit office of General Alloys Co., Boston. Before his more than two years' service with the War Department, Mr. Waindle had spent several years in engineering and manufacturing complex nickel-chromium alloys and in applying them in industrial processes.

♦ ♦ ♦

John E. Ott, plant manager of the Acme Steel Co., Chicago, has been appointed district director of Training Within Industry, War Manpower Commission, for Illinois and Wisconsin, with offices at 222 West Adams street, Chicago. He retains his connection with Acme Steel Co.

♦ ♦ ♦

F. E. Walling, previously assistant to the president of the Lewis Foundry & Machine Division, Blaw-Knox Co., Pittsburgh, has been appointed vice president in charge of operations for the division. **Ralph B. Kraft,** recently manager of roll sales, has been named vice president in charge of sales.

♦ ♦ ♦

A. F. Rucks has been elected president and general manager of the C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., succeeding the late C. D. Waters. Mr. Rucks has been associated with the company more than 30 years.

♦ ♦ ♦

G. E. Hunt has been appointed acting manager of the Atlanta territory for Cutler-Hammer Inc., Milwaukee. He has been with the company since 1920, recently as manager of the Indianapolis office.

♦ ♦ ♦

Robert C. Good, formerly metallurgical engineer for the Electro Metallurgical Sales Co., New York, has been appointed sales manager for the Union Electrical Steel Corp., Pittsburgh.

♦ ♦ ♦

S. Thom, Flour City Ornamental Iron Co., Minneapolis, has been elected secretary of the Twin City Personnel Managers Association.

♦ ♦ ♦

Henry N. Wheeler has been appointed sales manager of the Hartford Electric Steel Corp. and the Roxbury Steel Casting Co., Hartford, Conn.

♦ ♦ ♦

Samuel J. Walker, assistant to the president, Chicago Railway Equipment Co., Chicago, has been elected vice president.

♦ ♦ ♦

L. P. Jackson, vice president in charge of engineering, Mid-West Abrasive Co., Detroit, has been elected a director of the company.

Foundries Inspected By School Heads

With the purpose of stimulating interest in the foundry industry among boys in the junior and senior high schools of Cleveland, the Northeastern Ohio Chapter of the American Foundrymen's Association arranged a field day of inspection March 30, for the principals, assistant principals and vocational counsellors. Under normal conditions these men and women are totally unfamiliar with the foundry and therefore are in no position to discuss the subject, or direct the attention of students to this wide, promising and—at least at present—uncrowded field. It was felt that an actual demonstration of foundry operation would enable them to point out to their mechanically-minded students many of the advantageous opportunities presented by the ancient, yet continually renewed and modernized art of founding in metals.

Two typical foundries co-operated by granting permission to the party of approximately 100 to visit their plants, the Westinghouse Electric & Mfg. Co., on the West side and the National Aluminum Cylinder Head Co., on the East side of the city. The first is an old established, general jobbing and semiproduction plant, casting gray iron, aluminum, brass and bronze. The second is a new plant representing the most modern equipment, methods and general technique for the production of a specialized product in aluminum alloy to the extent of 30,000 castings per month.

Broken down into small groups and accompanied by competent guides, attention of the visitors to the Westinghouse plant was directed to many interesting features.

At the National Aluminum Cylinder Head foundry the visitors had an opportunity to note the orderly sequence of operation to reduce labor and facilitate production. Interesting features included: Different colors of sand for various purposes; cores blown on machines; cores rammed by hand; large number of women employes; skill required in setting wires in the thin core vanes; controlled temperature in core ovens; core assembling, fitting, gaging, cutting and pasting; large pot furnaces under positive temperature control; pouring the molds, and various other features.

At the conclusion of the inspection trip the party had dinner at the Cleveland hotel, where addresses designed to show the extent of the foundry industry and the advantages it presented to young men seeking a career, were presented by Walter L. Seelbach, secretary-treasurer Forest City Foundries Co., and A. C. Denison, president, Fulton Foundry & Machine Co.

The committee which arranged the program under the auspices of the Northeastern Ohio Chapter of the American Foundrymen's Association included Frank Cech, patternmaking instructor Cleveland Trade School, chairman; Gordon B. Carson, Case School of Applied Science; Pat Dwyer, engineering editor, THE FOUNDRY; William J. Feth, superintendent, Forest City Foundries Co.; William C. Manwell, superintendent, Fulton Foundry & Machine Co.

New Firm To Handle Equipment Sales

Russell F. Lincoln & Co., 1058 Maplecliffe drive, Lakewood 7, O., recently has been organized with Russell F. Lincoln as president, to act as a manufacturers'

RUSSELL F. LINCOLN

agent in Cleveland and the Ohio territory. The new company will represent the International Molding Machine Co., Chicago; the Modern Equipment Co., Port Washington, Wis., and the Claude B. Schneible Co., Detroit.

Mr. Lincoln was born in Quincy, Mass., in 1891 and was educated in the public schools of Cleveland. He then entered the employ of the Winchester Repeating Arms Co., New Haven, Conn., where he spent 12 years, and from the knowledge obtained in this work, became qualified as an expert in the handling of arms and ammunition in connection with aircraft armament. He was a lieutenant in the air service during the first world war.

Following the war, Mr. Lincoln entered the foundry field and immediately became a student of the late Prof. H. M. Boylston, Case School of Applied Science, Cleveland, and completed a special course in metallurgy and metallography of iron and steel given at Cleveland College. Mr. Lincoln joined the machine division of Osborn Mfg. Co., Cleveland, in 1922, was made assistant sales manager in 1933 and sales manager in 1939. He resigned that position recently to organize his own company.

Mr. Lincoln was active in the organization of the Northeastern Ohio Chapter of the A.F.A., served as its first secretary-treasurer and then for a number of years as treasurer. He is just completing a term as vice president of the chapter and has been nominated for the presidency for 1944-45.

Complicated Castings

...CLEAN AS A WHISTLE

TODAY, thanks to Truline Binder, shops and plants all over the country are turning out complicated castings with the greatest of ease. They're coming off the line—*clean as a whistle*—right on time!

For Truline with its superior workability helps skilled operators make cores quickly to amazingly close limits. Take the body of an oil-line valve. Look at the seat and the clean interior. Truline Binder shines on jobs like this!

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Consider Truline for your tough jobs—for any job, in fact, where you want to save time and money. The coupon at the right is for your convenience.

Save time these 3 ways...

1 GET FASTER FORMING!

Truline cores ram quickly, giving dense cores with freedom from sagging. *This means more cores per hour per core maker!*

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Truline cores harden under low oven heat, dry without oxidation. Oven-time is less, output greater!

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Truline cores burn out readily. Core sand shakes out easily, saving valuable clean-up time.

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foundry DEVELOPMENTS

WHILE in general the effect of superheating of gray cast iron has been explained by either the graphite nuclei theory or the non-metallic nuclei theory, present investigations lead to the opinion that the results obtained from superheating are due to the presence of gases rather than nucleation. Carbon monoxide and hydrogen both affect the graphitization of cast iron. Hydrogen eliminates ferrite, promotes formation of flake graphite, and affects tensile strength. Carbon monoxide promotes formation of ferrite, fine eutectiform graphite, and shows a marked change in tensile strength. Since considerable carbon monoxide and hydrogen to some extent are present in the melting operation, it is believed that superheating effect on gray iron is due principally to carbon monoxide, modified by hydrogen.

♦ ♦ ♦

DISCUSSING the production of sound magnesium castings in the Feb. 24 issue of *Foundry Trade Journal*, J. Haywood points out that porosity in such castings differs from the usual type encountered in aluminum alloys in that instead of being due to gas absorption, the porosity is caused by shrinkage of the eutectic mixture at the grain boundaries, leaving voids of varying magnitudes. The more massive type usually is due to area of the ingates being too small, restricting the flow of metal; ingates improperly placed, and insufficient and improperly placed risers. Microporosity of the smaller type usually is present where there is a rapid change in section, near an improperly designed ingate, and may be due to turbulence caused during the filling of the mold.

♦ ♦ ♦

COINING of malleable iron castings to provide accurate dimensions is practiced in many foundries, and an exploratory investigation on the effect of that operation on the physical properties of the iron indicates that the tensile strength and brinell hardness increase, and the elongation decreases; the amount depending upon the reduction in thickness of the piece and the pressure applied. However, since few castings are coined over the whole area, the changes in properties will not have an overall effect.

♦ ♦ ♦

BEST acid electric steelmaking practice endeavors to hold residual silicon to a maximum of 0.06 per cent, and residual manganese to 0.15 per cent. High residual manganese, over 0.15 per cent, greatly increases danger of skin porosity due to the fact that it reduces oxygen content of the bath and causes a more gentle boil. High residual silicon or maintaining conditions which cause reduction of silicon from the slag, are more effective than high residual manganese in producing gassy steel for the same reasons.

♦ ♦ ♦

EXTREMELY light weight of magnesium which is approximately 23 per cent that of gray iron and 65 per cent that of aluminum tends to throw the statistician considerably off the beam when it comes to estimating production possibilities. For example it has been estimated that in automotive gray iron foundries 100 pounds of iron could be produced per square foot of floor space per month while with magnesium the figure varies from 3 to 8 pounds per square foot depending upon the size, weight and intricacy of the castings. Similarly the output per man per month in gray iron is estimated at 12,000 pounds while for magnesium the estimate is from 250 to 320 pounds per man per month.

♦ ♦ ♦

RECENT development claims repair and salvaging of aluminum castings by cold welding without setting up stresses or crystallization due to high temperatures. Using metal spraying, it is said that the process provides fill-ins which will show no lines of demarcation after machining, and will pass critical x-ray examination. The work does not become over 100 degrees Fahr. in the operation, which is claimed to eliminate any possibility of stress.

♦ ♦ ♦

SCOTTISH foundry supplying alloy cast iron piercing and nosing dies for production of forced shell states that excellent life has been obtained from such castings, mentioning an average of 36,400 billets for a 25-pounder shell piercer, and comparable life for nosing dies. The iron has a composition range of 1.60 to 2.20 per cent silicon, 0.70 to 1.00 per cent manganese, 0.04 to 0.08 per cent phosphorus, 0.15 per cent maximum sulphur, 2.00 to 4.50 per cent nickel, 0.10 to 0.50 per cent chromium, and 0.60 to 0.90 per cent molybdenum. Addition of 0.15 per cent vanadium is said to result in increased performance of the piercing die to the highest figure in excess of 62,000 forgings. The alloy cast iron is produced in a 30-inch cupola. Castings are subjected to a stress-relief at 600 degrees Fahr. for 5 hours.

♦ ♦ ♦

A GOOD measure of the oxygen content in molten steel as determined by the aluminum oxide that will be formed if aluminum is added to the metal, can be found by the rate at which the carbon falls under reasonably constant temperature in the melting operation. Curves drawn on log-log paper with oxygen content as the abscissa and carbon content as the ordinate are used for the chart. Any testing method which determines carbon in a short time can be employed. Two samples are taken a standard interval apart, say 15 minutes. The difference between the two gives the loss rate, and that applied to the chart gives the activity of the oxygen.

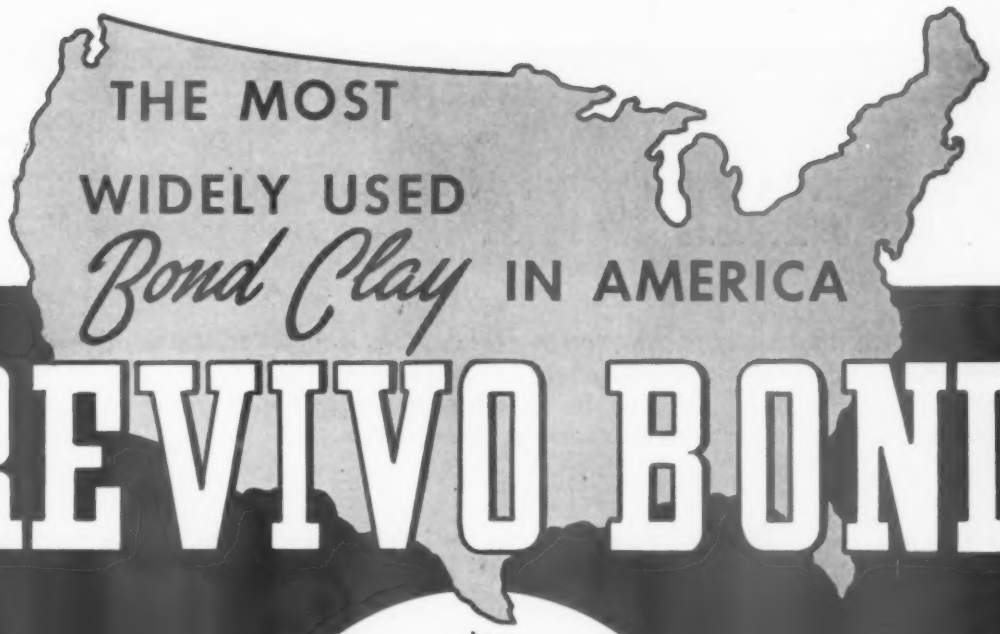
♦ ♦ ♦

WITH the end-quench or Jominy test method for determining the hardenability of steel receiving some attention in the cast steel field it might be well to call attention to the fact that the carbon content, and not the alloying agents is the factor that determines the hardness. In other words plain carbon and alloy steels of the same carbon content will show similar hardness on quenching. Function of the alloying agents is to permit the hardness to penetrate to a greater depth in the piece, or, as it more commonly is expressed, to increase the hardenability.

♦ ♦ ♦

EVERY dollar spent for good pattern equipment returns its investment many fold. Often a cheap pattern made for a short run results in repeat orders and many headaches from use of a poor pattern. E. B.

RADIOGRAPHS of aluminum alloy castings frequently have a mottled appearance which most industrial radiographers ascribe to either porosity in the castings, or to presence at grain boundaries of intermetallic compounds denser or less dense than the primary solid solution. However, an investigation by Glaisher, Betteridge, and Eberall, published in the Journal of the Institute of Metals (British) for February, 1944, indicates that mottling is a diffraction effect arising from the irregular distribution of Laue spots produced by diffraction from individual crystals, and weakening of the transmitted beam passing through certain crystals due to loss of energy which has been directed into the diffracted beams.



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All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

Tests suggest that metal penetration in steel castings is a matter of oxidation and that control over mold atmosphere will provide remedy for this problem, pinholes, scabs, etc. Addition to molding sand offers most practicable means of providing necessary reducing atmosphere

ENTIRELY new concept of what happens to ferrous metals as they are poured into sand molds, and the foundations of a vastly changed foundry technology are suggested from the preliminary study of research undertaken by Harry W. Dietert and his staff of sand technicians here.

Dietert has long been famous for his detailed analyses and probings into the behavior of sand at elevated temperature, and much of his equipment and procedures has become standard in foundry laboratories. His research with the dilatometer probably has done more than anything else to reveal the "why and how" of sand molds and cores at metal pouring temperatures.

In recent months, he has begun to attack the subject of finishes on steel castings—why there should be such phenomena as "grooving", pinholes, metal penetration into sand molds, blisters, scabs and the like. By a happy coincidence the dilatometer was found to be just the tool to provide some accurate information on these practical difficulties. A standard dilatometer specimen was rammed up—a cylinder about 1⅛ inches in diameter and 2 inches long—with a hole in the center at one end to accommodate a steel pin ¼-inch in diameter and 1¼ inches long. A plain carbon steel pin is placed in the hole, the specimen placed in the dilatometer and brought to various heats, allowed to cool and then broken open to see what has happened.

Atmosphere Controlling Factor

The idea of combining a steel pin with the dilatometer specimen was originated by Howard Taylor of the Naval Research Laboratory, and Harry Dietert gives him full credit for suggesting a procedure which has been productive of such enlightening results.

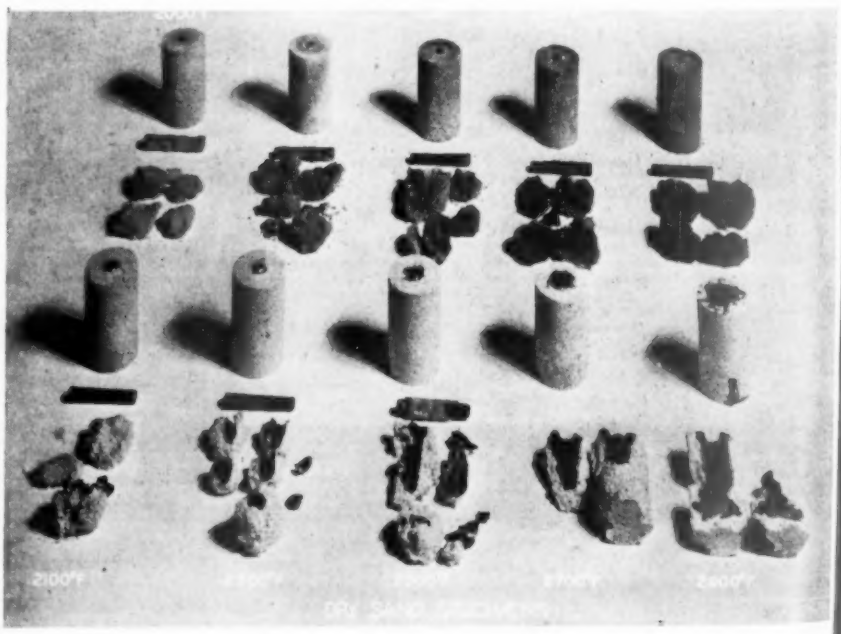
As tests with the specimen progressed, it became apparent at once that the atmosphere surrounding the mold was a controlliing factor on what might be expected at high temperatures. In one series of tests this was proved conclusively by running one test in air, a second with a flow of oxygen over the specimen and a third with natural gas atmosphere. Temperature was 2700 degrees. The specimen tested in oxygen was completely gone, the metal pin having been literally burned up and combined with the surrounding sand. The test in air was better, although much of the steel pin had penetrated into the sand. But the test in natural gas was the surprise. The pin was nearly as good as when it was placed in the mold originally, and there was virtually no penetration into the sand, no "grooving" of the steel.

From these and hundreds of similar tests, it was postulated that metal penetration in steel casting is simply a matter of oxidation. First the carbon in the surface of the metal is oxidized out, and then the iron is converted into a mixture composed of iron and iron oxides —usually to magnetite, a combination of one-third FeO and two-thirds Fe_2O_3. The oxidized iron meanwhile combines with the sand of the mold to form a hard, crusty substance resembling carborundum, even harder than the iron itself, which often adheres tenaciously to the casting after it is shaken out. Naturally, once the reaction has started, the heat generated by the oxidation speeds the reaction to completion.

At this point, Dietert and his researchers placed their findings alongside what happens in heat treating operations on steel. They noted the pronounced scaling tendency of steel heated in oxidizing atmospheres, and they noted how it was completely arrested by adjusting the atmosphere to inert or reducing. They reasoned that if this was the situation when steel was heated below the melting point, certainly it would be even more pronounced at the higher temperatures. So they began to figure out how it might be possible to control mold atmospheres. One way, of course, as already explained, is simply to direct a stream of reducing gas over the mold while it is at temperature, but this is rather inconvenient, impractical and too costly.

A second method is to include in the molding sand an addition agent which at

(*Concluded on Page* 93)



Dilatometer dry sand test specimens heated at temperatures ranging from 1600 *to* 2900 *degrees Fahr. Note indications of metal penetration on steel pins heated well below melting point*

Some EF Gas Fired, Oil Fired and Electric Furnaces

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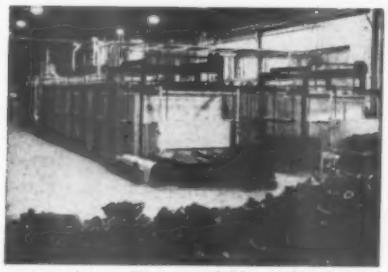
Roller Rail Pusher Furnaces

For annealing, heat treating, short cycle malleablizing, etc.



Used for handling miscellaneous products. The material is carried through the furnace in light baskets or trays. 40,000 pounds of malleable castings per day are annealed scale free in the above special atmosphere furnaces.

Chain Belt Conveyor Furnaces

For continuous heat treating small and medium sized products

For scale free hardening bolts, gears, bearing parts, springs, and miscellaneous other products in quantities. Material is loaded directly on belt, carried through the furnace and automatically quenched or otherwise discharged.

Pit Type Furnaces

Rectangular, Circular or other types

An efficient furnace with excellent temperature distribution. Large rectangular pits are used for annealing steel bars, tubing, etc. Circular types for various ferrous and non-ferrous products. Above installation is annealing coiled wire, and normalizing rod.

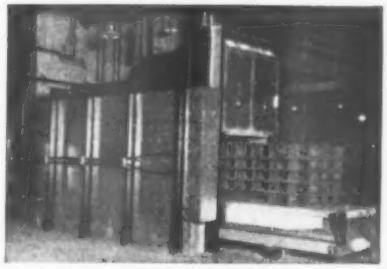
Suspended Conveyor Furnaces

For handling various products and processes

For continuous heat treating metal parts, glass, vitreous enameling, etc. The work is suspended on hooks and carried through the equipment. The above installation is a continuous unit for hardening, drawing, and automatic quenching automobile axles.

Car Type Furnaces

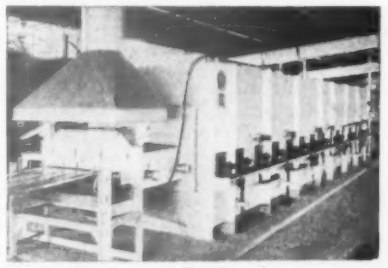
For annealing and various heat treating processes



Used for annealing castings, bar stock, plates, stress relieving welded structures, heat treating and carburizing armor plate, etc. The above single ended car type furnace is annealing steel castings. Car type furnaces may be built to handle any size product.

Roller Hearth Conveyor Furnaces

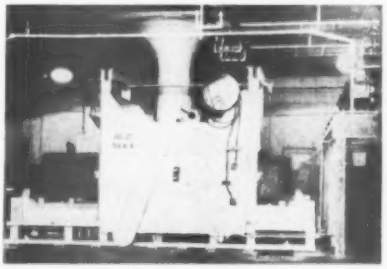
For hardening, annealing, copper brazing, etc.



The material is conveyed through directly on roller hearth or on trays. Used for hardening gears and other finished parts, annealing strip, tubing, castings, etc. Also for copper brazing, normalizing, and other processes. Above installation is bright annealing steel strip.

Reciprocating Type Furnaces

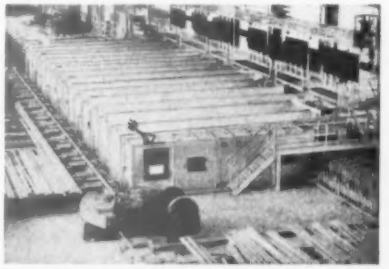
For nitriding and other special atmosphere treatments



Similar to car type but furnace moves and base remains stationary. Used for nitriding and other special atmosphere treatments where permanent connections to retorts are desired. Above furnace is nitriding aircraft engine parts.

Large Automatic Conveyor Hearth Types

For various heat treating processes and products

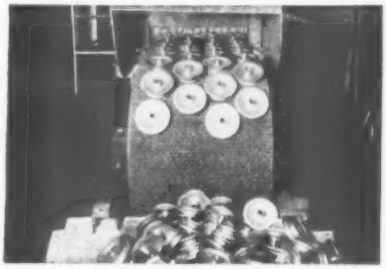


Structural shapes up to 90 feet long are automatically charged into the above furnace, carried across the heating chamber and discharged through a spray quench—everything is automatic. Uniform temperature is maintained throughout the 93 x 26-ft. heating chamber.

Mesh Belt Conveyor Furnaces

For copper brazing, drawing, etc.

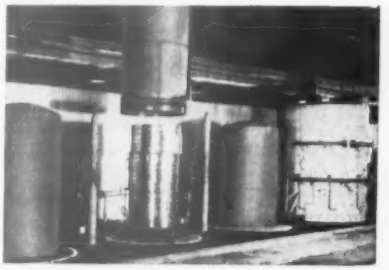
Material is loaded directly on belt. Above illustration shows discharge end of a continuous furnace copper brazing fan pulley assemblies. The completed unit is discharged securely joined, clean, and bright.



Bell or Hood Type Furnaces

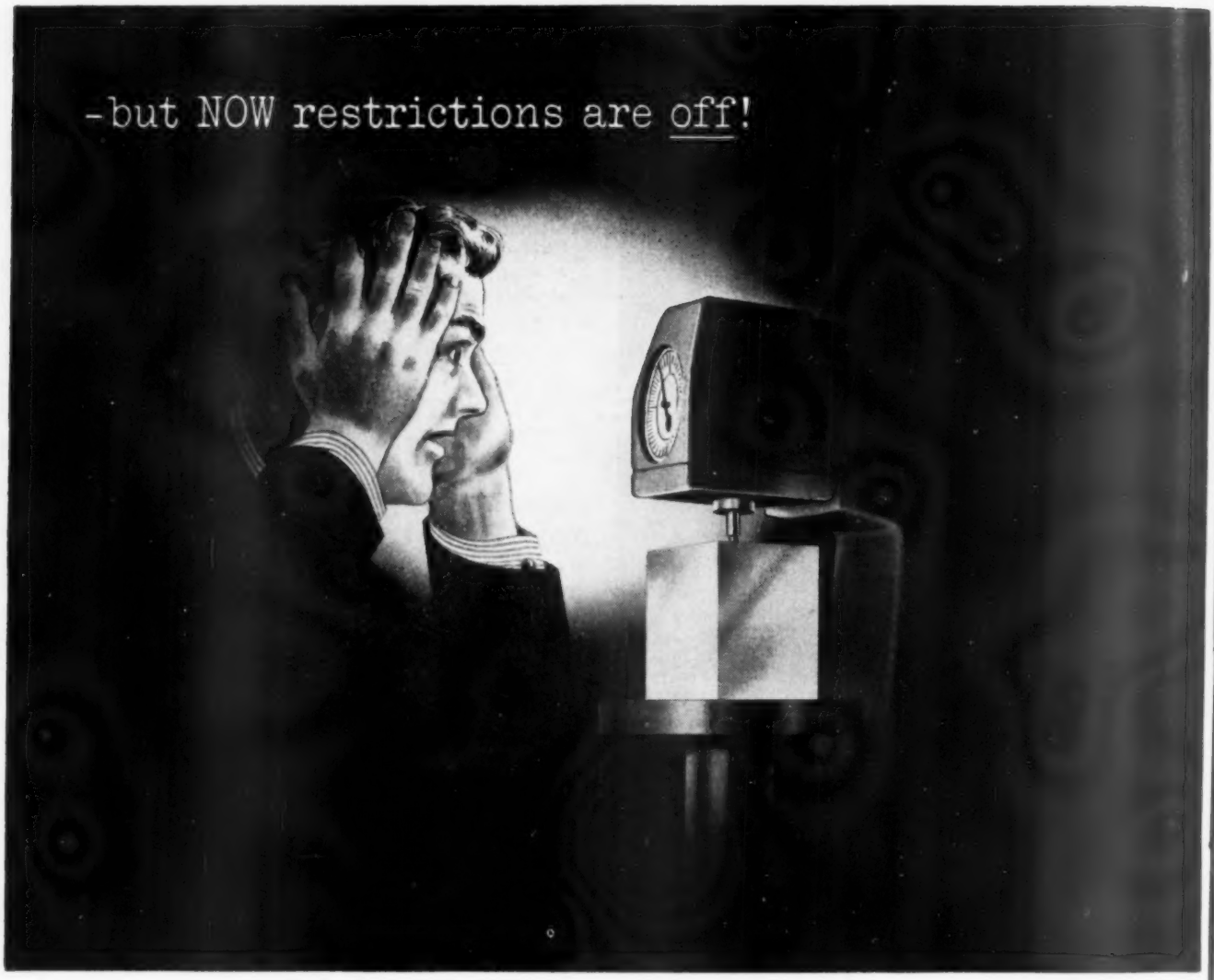
For annealing wire, strip, nitriding, etc.

Charges are placed on fixed bases, furnace is placed in position by crane or hoist. Inner cover contains protective atmosphere. May have forced convection to promote speed of heating or temperature distribution. This installation is bright annealing steel strip.



Additional information on above or other types of EF production furnaces gladly sent on request.

The Electric Furnace Co., (Gas Fired, Oil Fired and Electric Furnaces) **Salem, Ohio**

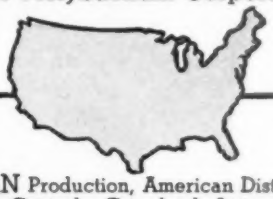


Five points more of

MOLYBDENUM *would have done it!*

Often, while the use of Molybdenum was restricted by Government order, it was hard to get the required physical properties in high-grade steels. And in many troublesome cases, as little as five points more of Molybdenum would have assured success.

There is now no such difficulty. Since the beginning of the year, restrictions are off. There is Molybdenum for all uses. It is necessary only to know what percentage of Molybdenum will give the best result, and to employ that percentage. Inquiries concerning any use of Molybdenum, Tungsten, or Boron will be welcomed by the Molybdenum Corporation.



AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.

MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING, PITTSBURGH, PA.

MCA

(*Concluded from page* 90)

heat will generate the reducing atmosphere, and perhaps in addition glaze over the surface of the mold where molten metal comes in contact. So they started out experimenting with a long list of addition agents, all of which were added in the amount of 5 per cent, more than is conventional in foundry practice but an amount which provides a readily observable action.

Among the materials investigated were sea coal, urea, sodium fluoride, cast iron borings, reduced iron powder, sugar, wood charcoal, starch, ascarite, boric anhydride and a number of other lesser known substances. Both green sand and dry sand molds were made for dilatometer tests and there was little significant difference between the two types of sand. However, it was definitely proved that the stronger the reducing action of the addition agent, the better surface there would be on the steel pin specimen after the test.

Another interesting disclosure from these tests was that metal penetration will start at temperatures as low as 1500 degrees, while uniformly good signs of penetration can be detected at 2000 degrees, or 700 degrees below the melting point of the steel. Series of tests were carried out at 100-degree temperature intervals, from 1500 all the way up to 2900 degrees.

New Use for Rat Poison

Particularly good results were obtained with the use of 5 per cent sodium fluoride in the sand, since this chemical both supplies a reducing atmosphere and exerts a glazing action on the mold surface. Difficulty is that sodium fluoride or "rat poison" as it is commonly called, is a highly poisonous material not recommended for general use in the foundry. Furthermore its use in molding sand is not productive of the best shakeout properties. Better from the standpoint of shakeout qualities is a molding sand containing 3 per cent sugar. Sea coal gives fairly good results, but wood charcoal, being a purer carbonaceous type of material, yields better results than does sea coal.

Here, in somewhat sketchy fashion, is the outline of research which may provide steel foundrymen with answers to their troubles with metal penetration, grooving and the like, and at the same time open up wholly new vistas in the field of mold preparation and pouring. It is an intriguing prospect—controlling mold atmospheres—and one which poses a number of intricate problems as far as its practical application is concerned. It would seem to behoove steel foundrymen in particular to keep posted as developments mature.

The work is so new that Dietert has not had time to prepare a full report of all his tests. He touched on the development at a sand session at the Buffalo convention; a more complete summarization of the work should be forthcoming in the months ahead. He has prepared for display a moving picture which hits the highspots of the development, its initial showing being made at a Detroit chapter meeting April 20, where Dietert explained the results of his studies for gray iron and steel foundrymen.

Use of 5 per cent addition agents which either generate reducing atmosphere or glaze the mold reduces metal penetration and grooving as shown here. Of the three, sugar appears to have the most beneficial effect

Also available for showing is a Dietert movie 1200 feet in length depicting in graphic fashion for the benefit of practical foundrymen the behavior of sand at elevated temperatures.

Allied with Dietert's present work on mold atmosphere control is another new concept concerning the hot permeability of sand. Research has shown that actually permeability measurement of sand is little more than a gage of its fineness, that much more important is the matter of mold gas pressure at pouring temperatures. Further studies on this subject are being made.

OBITUARY

Paul M. Snyder, whose appointment as sales manager of the Climax Molybdenum Co. was announced in THE FOUNDRY for April, died March 23 in Canton, O., where he made his headquarters. Mr. Snyder had been associated with Climax since 1932, originally as a metallurgical engineer in the Canton area. Previously he had been assistant to the vice president of the Republic Research Corp., joining that company when Republic Steel Corp. absorbed Central Alloy Steel Corp. Mr. Snyder had been connected with the latter and a predecessor company since 1915.

° ° °

Florence M. McCarthy, widely known salesman of foundry equipment and supplies, died March 27 in Columbus, O. He began his foundry career with the Foster Stove Co. and the Lambert Foundry & Machine Co., Ironton, O. As a journeyman molder he worked for the Globe Stove & Range Co., Kokomo, Ind., and at other plants in the Middle West. In 1911 he became representative of the Detroit Foundry Supply Co. In 1913 he joined the Hill & Griffith Co., Cincinnati and remained with that company from 1913 to 1916 and again from 1926 to 1932. In the 10-year interim he served as manager in the Chagrin Falls, O., plant of the Henry Furnace & Foundry Co., Cleveland. Since 1933 he has been representative of the Federal Foundry Supply Co., Cleveland, and the Ironton Fire Brick Co., Ironton, O.

° ° °

Roscoe C. Pattison, 63, formerly plant superintendent of the T. H. Symington Co., predecessor of the Symington-Gould Corp., Rochester, N. Y., died March 19 in that city. He retired about 6 months ago as head of the patternmaking department of the Pratt & Letchworth Co., Buffalo.

° ° °

Leon R. Noonan, 50, president, Noonan-Malmstrom Co., Chicago, died April 1 in Hinsdale, Ill. Mr. Noonan founded the company, a gray iron foundry, in 1927.

° ° °

Edgar J. Cook, 56, foreman for the C. & G. Foundry & Pattern Works, Indianapolis, died April 6 in that city.

° ° °

Con Ehret, 83, who established the Oklahoma Foundry Co., Oklahoma City, Okla., died March 30 in that city. He retired 15 years ago.

° ° °

Harry F. Menzel, 51, owner of the Indianapolis Pattern Works, Indianapolis, died there recently. He had operated the company the last 15 years.

Laboratories Marks 50th Anniversary

Underwriters' Laboratories Inc., Chicago, is observing its fiftieth anniversary this year. During the past half-century it has approved some 375,000 different products and investigated many more than that number for the 5000 manufacturers of the various items.

Sponsored and financed originally by insurance companies, Underwriters' Laboratories since 1917 has been entirely self-supporting and is a non-profit organization. The cost of operation is borne by individual manufacturers who make use of its facilities, charges being based on the cost of work done. Considerable war work now is being handled.

...BARRAGE

WHEELABRATOR AIRLESS BLAST CLEANING

1 SAVED ON TIME

"Reduced cleaning time approximately 50%."
"5 hours' former cleaning time reduced to 15 minutes."
"60 man-hours of cleaning time reduced to 7 man-hours with the Wheelabrator."
"32 hours' cleaning time reduced to 7 hours."
"Time cut from 24 hours to 8 hours."

2 SAVED ON COSTS

"Reduced direct labor cost 50%."
"Saved 300 cubic feet of air per minute."
"Saved 75% of our labor in cleaning."
"Cleaning now with 4 less operators."
"Our electric bills have been cut almost in half."

3 SAVED ON MACHINING, GRINDING, INSPECTION

"Decided increase in tool life between grinds."
"Considerable saving in grinding and grinding wheel costs."
"Wheelabrating shows up any minor surface imperfections."
"Considerable saving in our Machine Shops from extra tool life."
"Tool wear and breakage materially cut down."

WORLD'S LARGEST BUILDERS OF AIRLESS ABRASIVE BLAST EQUIPMENT

ARMY (E) NAVY
THE AMERICAN WHEELABRATOR
TRADE MARK REG. U. S. PAT. OFF.

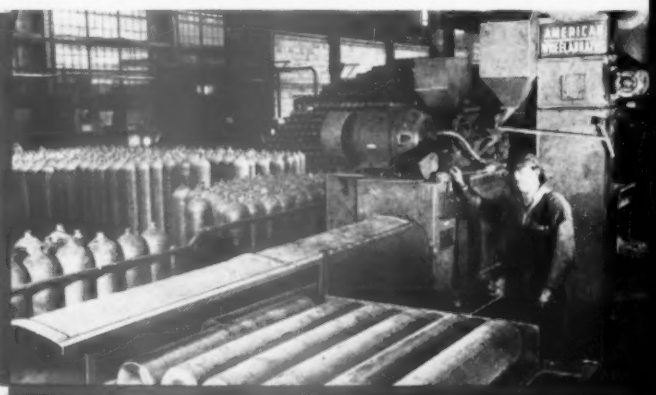
AGAINST Time

EVERY production operation represents a closely calculated MEASURE OF TIME. In metal cleaning, the time factor is usually responsible for high costs. It is the important element to watch.

As time is cut, costs are cut also. The airless Wheelabrator lays a veritable barrage against time. It saves machine and labor time on cleaning, inspection, machining and grinding.

Its cleaning action is consistent . . . the finish is uniform . . . there is less fluctuation in production . . . therefore, present and post-war contracts can be estimated more closely and at a lower figure.

More and more manufacturers are leveling a barrage at time costs by replacing outmoded methods of metal cleaning with the Wheelabrator. In planning for highly competitive post-war markets, consider the advantages of this modern method as reflected in the following case histories:



American
FOUNDRY EQUIPMENT CO.

505 S. Byrkit Street
MISHAWAKA, INDIANA

WASHINGTON
* * * Notes

PRICE control over small orders for nonferrous castings has been lifted by OPA. This will eliminate some paper work involved in these so-called "nuisance" orders, although foundries are required to file a statement with OPA on the 15th of January, April, July and October giving the quarterly weight and dollar amount of all nonferrous castings sold under this price control exemption, along with similar data for castings sold under the applicable price regulation, MPR-125.

★ ★ ★

Nonferrous casting orders exempted from price control include the following: Copper base castings involving not more than 25 pieces of any one pattern and having a total weight before machining of not over 150 pounds; aluminum or magnesium base castings of not more than 25 piece weighing a total of not more than 100 pounds. In order to prevent foundries from splitting up orders to avoid price ceilings, a limit is imposed on the volume of small orders that may be accepted from one buyer in any 30-day period. In the case of copper base castings the limit is 50 pieces of one design having a total weight of 450 pounds, and for aluminum and magnesium it is 50 pieces weighing 300 pounds.

★ ★ ★

THE EXEMPTION from price control does not apply to nonferrous castings for which prices are provided in a pricing agreement or contract, price list, or schedule, such as a flat price for similar castings or groups of castings, at the time the order is received. Likewise, the exemption is inoperative for castings that are the same as others sold, contracted for, or offered for sale to the same buyer in the 30 days before receipt of the order, for which ceiling prices already had been computed by the seller in keeping with OPA pricing provisions.

★ ★ ★

Certain brass ingot price ceilings have been raised ¾ to 1½ cents a pound by OPA to compensate producers for higher cost of virgin metal and higher grade scrap which has to be used in producing the affected grades, because of insufficient supplies of lower cost scrap normally used. Principal grades of the 85-5-5-5 ingot are up ¾-cent to a range of 12.00c to 13.75c, according to alloy content, while new ceilings for 80-10-10 ingot are up 1½ cents to a range of 13.00c to 20.00c. These are carlot prices. Some modification in price ceilings on castings affected by the higher ingot cost is indicated as a result of these boosts.

Russia may have been carrying most of the land fighting load in Europe for the United Nations for many months, but the equipment aid she received from the United States during the period has been considerable. From October, 1941, to this March the Soviet Union received 8800 planes, 5200 tanks and tank destroyers, 190,000 trucks, 66,000 jeeps and other vehicles, 1,450,000 tons of steel, 420,000 tons of nonferrous metals and 200,000 tons of explosives, to say nothing of large quantities of machinery, food and clothing. Growth of this aid to Russia has been steady—more than 1,000,000 tons in January and February, 1944, compared with 670,000 tons in the like 1943 period and 200,000 tons two years previously.

★ ★ ★

In the three years since March 11, 1941, when the Lend-Lease Act was passed, the United States produced 58,000 tanks and sent 23,000 to its allies, built 1,900,000 trucks and other military vehicles and lend-leased or sold 750,000.

★ ★ ★

WAR contract terminations to date have developed relatively few financial claims against the government, but this hardly is to be taken as an indication of what may be expected with victory and wholesale terminations. For one thing, stocks of raw material and common components are disposed of more easily today than they will be when the pressure for war production dwindles. Analysis of 7675 war-contract terminations shows that almost three-fourths involved no claims. One-half of the claims involved less than $10,000 each.

★ ★ ★

Construction work has dropped more than 60 per cent since a year ago and is down more than 75 per cent from the wartime peak of August, 1942, when total value was nearly 1½ billions. In contrast to the bulge in military and industrial building of a year or two ago, recent activity has been rather equally divided among military, industrial, housing, and all other construction.

★ ★ ★

MANUFACTURERS of cast iron ware no longer are restricted as to the specifications for the types of ware they are permitted to make. Previously each maker was permitted to produce only a few sizes of such items as skillets, griddles, kettles, etc. The allowable volume of production is approximately at prewar levels, although there is no certainty that output will reach the permitted ceilings, because many manufacturers are engaged in war work.

★ ★ ★

Weight limitations on cast iron soil pipe also have been revised with the granting of permission by WPB to producers to make extra heavy pipe. Production of this type soil pipe had been prohibited since June, 1942, and since that time only a single weight, "victory weight," has been made. The move reflects increased supplies of raw material, plus the fact the extra heavy pipe will not require additional manpower or facilities for its production. In addition, there are large stocks of extra heavy fittings that cannot be used satisfactorily with the lighter weight pipe.

★ ★ ★

INVENTORIES of malleable iron castings among users now are limited to a 45-day supply. The WPB order which imposes this limitation also prohibits malleable foundries from making deliveries of castings if they know such deliveries would increase the recipient's stock beyond the 45-day supply. In cases of undue hardship, appeals from the order may be filed.

★ ★ ★

ADDITIONAL uses of aluminum for products essential to the war effort now are permitted by WPB. The list of items, among others, includes automotive trucks and trailers, fire-fighting equipment, signal and alarm equipment, food-processing machinery, industrial fans and blowers, industrial safety equipment, engineering instruments, safety control and heating control instruments, jigs and fixtures, and industrial lighting equipment.

W.G.G.

ARMY FILMS: A growing list of motion pictures specially prepared and edited for showings in war plants and industrial meetings is available from the War Department. Actual combat scenes make many of these films outstanding as dramatic eyewitness presentation of modern warfare. Plants desiring to show the pictures should address their requests to: Chief, Industrial Services Division, Bureau of Public Relations, War Department, Room 2-E-867, The Pentagon, Washington. Requests are forwarded to a distributor in one of the film-exchange centers established in some 300 cities which will handle arrangements. Plants not having projection facilities may obtain them from the distributor at an authorized scale of rates.

THIS BABY REALLY GRINDS

The NEW "MASTER" PNEUMATIC GRINDER

Just what you have been looking for—absolutely the last word in pneumatic grinder design—light in weight—good balance—and plenty of power without vibration.

Used with wheels up to 8 inches the new "MASTER" Grinder will help overcome your man-power shortage on all grinding jobs up to its wheel capacity—and turn out a full quota of work month after month with very low down-time.

THE "MASTER" Line Includes:

HAMMERS
FLOOR RAMMERS
GRINDERS
CHISELS
also
REBUILDING OF ALL PNEUMATIC TOOLS TO "MASTER" STANDARDS

NOTE THESE FEATURES

1. The only grinder with Hard Chrome Plated Cylinder—giving up to 3 times normal life.
2. Governor integral with drive shaft eliminates end play.
3. Large oil chamber with external oil regulator insures positive lubrication.
4. Internal keyway on drive shaft minimizes shaft breakage.
5. Manual or automatic trigger control for safety.

Write for Discriptive Literature

INDUSTRY ...Briefs

UNITED STATES Maritime Commission has awarded approximately one-half of its "M" pennants to small companies with fewer than 500 employes. In this classification producers of castings include: Beaumont Iron Works Co., Beaumont, Tex.; Colonial Foundry Co., Louisville, O.; Enterprise Wheel & Car Corp., Bristol, Va.; Foran Foundry & Mfg. Co., Flemington, N. J.; Golden's Foundry & Machine Co., Columbus, Ga.; Bartlett-Hayward Division, Koppers Co., Baltimore; Hesse-Ersted Iron Works, Portland, Oreg.; Sterling Steel Foundry Co., Braddock, Pa.; Buckeye Iron & Brass Works, Dayton, O.; R. D. Cole Mfg. Co., Newnan, Ga.; Filer & Stowell Co., Milwaukee; Homestead Valve Mfg. Co. Inc., Coraopolis, Pa.; Los Angeles Steel Casting Co., Los Angeles; Paxton-Mitchell Co., Omaha, Nebr.; Pottsville Castings & Machine Shops Inc., Pottsville, Pa.; Sumner Iron Works, Everett, Wash.; Watkins Inc., Wichita, Kans., and Webster-Brinkley Co., Seattle, Wash.

• • •

Ordnance Steel Foundry Co., Bettendorf, Iowa, has let contract for a plant addition to cost about $125,000.

• • •

Progress Pattern & Foundry Co., St. Paul, has let contract for a one-story shop addition, 45 x 50 feet.

• • •

D & M Machine Works, Torrance, Calif., has awarded contract for construction of a new foundry building, 45 x 130 feet.

• • •

Ferro Machine & Foundry Co., Cleveland, has been authorized by the Defense Plant Corp. to spend $400,000 on plant rehabilitation.

• • •

General Malleable Corp. has been authorized by the Defense Plant Corp. to spend $165,000 for the purchase of equipment for its Waukesha, Wis., plant.

• • •

Aircraft Components, 8000 Woodley Avenue, Van Nuys, Calif., is constructing a foundry building and a first aid building to cost $3700.

• • •

Belle City Malleable Iron Co., Racine, Wis., has won the Army-Navy white star, renewing the "E" pennant awarded originally more than 6 months ago.

• • •

Maytag Co., Newton, Iowa, has let contract for a one-story building, 80 x 125 feet, to cost about $100,000, to house laboratory and chemical testing divisions of its research and development department.

• • •

War Production Board has cancelled plants for construction of a $250,000 magnesium foundry to be operated by the National Magnesium Casting Co. at 3314 Morganford Road, St. Louis.

• • •

Mack Mfg. Co.'s Allentown, Pa., plant has been awarded the National Security Award by the Office of Civilian Defense for its maintenance of superior security and protection measures.

• • •

Ohio Steel Foundry Co. has started sustained production at its South Plant at Lima, O., for the first time since the $3,500,000 unit was constructed more than a year ago.

• • •

Advance Aluminum Castings Corp., Chicago, marked its twenty-fifth anniversary on March 19. Founders and present management of the company are Nels Shoan, E. G. Grundstrom and Roy W. Wilson.

• • •

Ampco Metal Inc., Milwaukee, has acquired through lease a 3½ acre site in Burbank, Calif., on which a foundry will be constructed to replace smaller facilities in Hollywood, Calif. It will be equipped with electric melting furnaces and centrifugal casting machines.

• • •

Malleable iron castings production in February by foundries reporting to the Department of Commerce totaled 74,371 tons, compared with 75,247 in January and 66,401 in February, 1943. February orders booked, less cancellations, totaled 78,503 tons, against 93,261 in January and 87,728 a year ago.

• • •

Foundry equipment orders booked in February represented 456.8 per cent of the 1937-1939 monthly average, according to the Foundry Equipment Manufacturers Association. This was the highest in 11 months and compares with 378.3 in January and with 399.5 in February, 1943.

• • •

Foundries among recent recipients of the National Security Award granted by the Office of Civilian Defense include the following: McWane Cast Iron Pipe Co., National Cast Iron Pipe Co., American Cast Iron Pipe Co., and United States Pipe & Foundry Co., all of Birmingham, Ala.; Continental Foundry & Machine Co., East Chicago, Ind., and Johnson Bronze Co., New Castle, Pa.

H. K. Porter Co. Inc., Pittsburgh, has purchased the Mt. Vernon Car Mfg. Co. and its subsidiary, J. P. Devine Mfg. Co. Inc., both with plants at Mt. Vernon, Ill. The Porter company also is operating a naval ordnance plant at Blairsville, Pa., and in 1943 purchased the Quimby Pump Co. with plants at Newark and New Brunswick, N. J.

• • •

Joshua Hendy Iron Works, Sunnyvale, Calif., will complete 73 Liberty ship engines which are being built by the Iron Fireman Mfg. Co., Portland, Oreg., when a fire put the latter's plant out of operation. Iron Fireman had delivered 312 engines under a contract for a total of 389. Filer & Stowell Co., Milwaukee, will build the other four engines.

• • •

Brass and bronze ingots shipped during February by 55 manufacturers totaled 43,340 tons, compared with 43,569 tons in January and 42,032 tons in December, according to the Defense Council of the Ingot Brass and Bronze Industry. The February figure is estimated to represent more than 95 per cent of shipments by the entire ingot brass and bronze industry.

• • •

Electro-Alloys Co., Elyria, O., is starting a $500,000 plant expansion, including erection of a new foundry building and installation of equipment. The expansion will enable the plant to take over the production of corrosion and heat resisting steel castings, work now done by the parent organization, American Manganese Division of American Brake Shoe Co., Chicago Heights, Ill.

Equipment Group in Larger Offices

Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers Association, has announced that the offices of the association have been moved to larger quarters in the Engineers building, Cleveland 14. Mr. Tuscany has indicated that the increase of members of the F.E.M.A. over the past several months and the broadened activity which the organization is handling in the interests of its members has dictated an enlarged national headquarters.

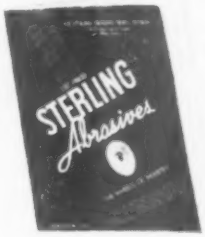
Importance of Fuel Saving Stressed

The importance of conserving fuel by reduction of heat loss from industrial equipment is stressed in a 24-page booklet printed by the Industrial Mineral Wool Institute, 441 Lexington avenue, New York 17. The material is a reproduction of the Bureau of Mines' Information Circular 7263, and incorporates suggestions for correcting heat losses. A copy is available upon request to the institute.

STERLING
THE WHEELS OF INDUSTRY

Speeding UP Our Wheels And Your *Production*

Your workmen turn out better work faster when they know their tools are safe. That is why we test all Sterling Grinding Wheels beyond their recommended speeds—to be certain you have long, trouble-free operation. This takes time and extra workers, but is well worth it in the resulting increased confidence foremen and operators have in the "Wheels of Industry".



Sterling Catalog No. 43 is recommended reading for anyone desiring full information on all types of grinding. Sent free upon request.

Running your Sterling Grinding Wheel at its recommended speed is a certain way to obtain longer, more efficient grinding service. Then, the wheel's special bond, grain, and structure have a chance to get in their best work on your jobs.

The problem of finding the correct wheel for your work need not be difficult . . a consultation with a Sterling engineer will often create new opportunities for increasing production, sometimes at much lower cost. Sterling investigation is as thorough as our wheel testing . . write today . . a Sterling engineer will gladly call and work with you on grinding problems of wartime or post-war production.

• STERLING ABRASIVES •
THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO
THE WHEELS OF INDUSTRY

BILL

BY PAT DWYER
Drawings By RICHEY

RECENTLY one of my able young grandsons who knows at least twice as much as I did—and with all due modesty I must admit that I considered myself quite a knowing young cove at the age of ten — asked my opinion of a book containing a collection of stories by famous foreign authors. He had discovered the book while nonchalantly rooting through the shelves of a book case where I keep a rather nondescript collection of volumes picked up here and there in second-hand book shops, rather frowsy and run down at the heel —the books I mean—and therefore barred from admission to the family book case where the bindings are new and shiny and therefore harmonize with the furniture, or the drapes—or—well, with something.

In my capacity as nominal head of the clan, at least in this part of the country, I was pleased to find this inherited love of reading breaking out in the young prowler. In fact that is about the only characteristic we share in common. With a body strongly reminiscent of young Tarzan, and topped off with a brilliant red hat set well back on the head, he bears little resemblance to his maternal grandpa at a similar age. Maybe some day when I have the time I shall do a bit of delving into his paternal ancestry. I shall not be at all surprised to unearth an old Irish king 7 feet high, 3 feet wide, with a gold crown cocked on three hairs of his head, a double-bitted battle axe in his stout right hand and a great red beard cascading down over his tunic to the emerald belt buckle. The old boys went in rather strongly for brilliant colors and jewelry.

In the present instance the jaunty red hat causes me to shiver involuntarily, partly from carefully concealed admiration, and partly from an inferiority complex that prevents me now, and even to a greater degree prevented me in my youthful days, from wearing anything that might attract attention. I secretly envied the other boys in my group who bravely, or perhaps brazenly, flaunted anything new in the face of friends, neighbors, chance acquaintances, and enemies, particularly enemies. On the comparatively few occasions I was lucky enough to get a new Glengarry with two tails hanging from the stern, I slid around corners and ducked through side streets to and from school, or in any other activity that took me abroad in the light of day. I dreaded comment of any kind, favorable or unfavorable. Since these far away days of my youth I have—as Bill sometimes claims—been everywhere and seen nearly everything worth seeing, but still I cannot whip my courage up to the point of wearing a bright red hat.

On the present occasion I told the young seeker after knowledge that the book was regarded rather highly in literary circles, but I did not think he had arrived at an age where he could appreciate it properly. Later, I would be glad to let him have it. In the meantime I suggested he would do well to stick to a series he is now devouring avidly, covering the adventures of four intrepid young men among the Indians in the days when the Ohio country was a wilderness and was referred to vaguely as the Northwest Territory. I cannot remember the entire series, but the following list of titles indicates the general theme and may touch a bell in the memory of men who read stories as I did many years ago: *The Border Watch; Riflemen of The Ohio; Eyes of The Woods; The Young Trailers; The Free Rangers.*

After he left I picked up the book and skimmed through it partly for entertainment and partly to make sure there were no passages that might cause his mother to lift an eyebrow when and if she found him reading it. A dutiful daughter, she is kind enough to admit that I am practically immune to anything in the shape of the spoken, written or printed word, due of course to long foundry training and environment, but thank heaven, she hopes her son will be brought up in a different atmosphere. Well, all I can say is that she has cut herself a man size job. From the age of 10 upward, boys seem to acquire a remarkable stock of information and misinformation. At one time I heard a crabby old schoolmaster claim they absorb it through their pores. On the same subject Bill claims they soak it up and become contaminated in the same manner that metal soaks up gas and becomes contaminated in the furnace that is not operated properly. Never mind asking me for the remedy. This is not a sermon.

Busy little bee does not miss much

Bill came in while I was looking through the book. "Here it is," he said, "well into the spring of the year, sun shining brightly, little birdies gaily twittering, buds and flowers bursting forth, victory gardens crying for attention, neighbors oiling the lawn mowers and washing the accumulated winter grime from the windows, and here you sit like a shrunken image of Buddha taking a leisurely gander through an old moth-eaten book probably thrown away by the truck driver during the last waste paper drive around this here neighborhood. Haven't you any sense of shame or ambition or energy, or, or—any of that there kind of stuff?"

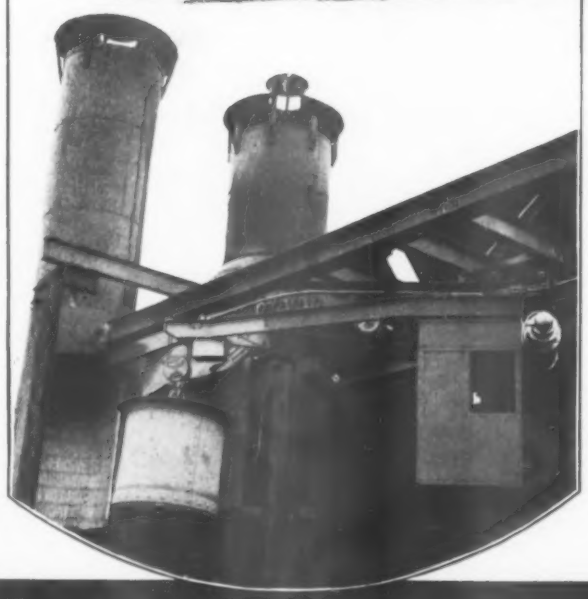
"No," I assured him cheerfully. "What with the war and one thing and another I have a sufficient number of deputies around the old homestead to take care of everything. While their husbands are working diligently for Uncle Sam in various parts of the world, these deputies insist on relieving me of every form of activity with the exception of eating, sleeping, an occasional drag of a pipe and a dip into a book now and again. Quite an ideal arrangement. I toil for a cruel taskmaster from 8 a. m. to 5 p. m. six days a week, but for the remainder of the time I live the life of Reilly and, as you see me now, study the works of the great masters. For example here is *A Piece of Bread*, by a French author, Francois Coppee."

"Does not seem much of a title. Think the author made any dough out of it? Go ahead, what happened?"

"When the Germans invaded France during the Prussian War, a young French nobleman burning with patriotism hurried home from a gay visit in England and joined the French army in time to be penned up in Paris during the siege. One night in disgust he threw a piece of hard army bread on the muddy ground. A soldier of the line pounced on it, wiped off the mud on the sleeve of his coat and wolfed the bread. The noble duke was overwhelmed with shame. He struck up a friendship with the poor unfortunate and was astonished to learn that as child, boy and man he had

(*Continued on page* 103)

GET BETTER METAL INTO THE FLASK *Faster!*



Scientific foundry practice demands control of all materials in the charge. Profits are determined by the cost of handling these materials. Both can be obtained by mechanical charging. When metal comes out of the cupola, quicker pouring into the flasks is assured with the aid of overhead handling. Flexible MonoRail arrangement insures safe handling at the cupola — quicker distribution of metal to pouring floor and increased speed of pouring. In foundries where speed, safety, efficiency and accuracy are of major importance — that's where American MonoRail equipment is usually found. Why not arrange for an American MonoRail Engineer to survey your requirements at no obligation?

THE AMERICAN MONORAIL CO.

13104 Athens Avenue ★ Cleveland 7, Ohio

Products that talk your language..

Listed below are five major classifications of Electro products that talk the language of thousands of foundrymen...both management and operating personnel.

They are manufactured to increase production rates...lower fuel or power costs ... give greater durability... directly contribute to lower plant operation and maintenance.

Most convincing testimony to the integrity of these claims is Electro's impressive record of growth and achievement built up during the past 25 years.

Specific performance facts and figures are available. They will demonstrate what Electro products can do for your own operations. Inquiries will receive immediate attention.

- **TERCOD CRUCIBLES**
  Fuel savings up to 50%; hourly metal production increased 20% to 60%; from 15% to 50% longer life.
- **ELECTRO SUPER REFRACTORIES**
  High resistance to thermal shock and spalling; great strength at elevated temperatures; resistance to abrasion and growth.
- **ELECTRO HIGH TEMPERATURE CEMENTS**
  Greater durability; higher heat resisting qualities; valuable time saved through easy application; simple preparation.
- **ELECTRO ABRASIVE WHEELS**
  Resin bonded; tough, durable; superior in cutting action.
- **ELECTRO STOPPER HEADS**
  Maximum resistance to abrasion; great hot load-bearing capacity; high softening point; high cold strength; proportioned thermal conductivity; spalling resistance.

ELECTRO REFRACTORIES AND ALLOYS CORP.

EXECUTIVE OFFICES: VARS BUILDING, BUFFALO 2, N. Y.

Manufacturers of Crucibles, Alloys, Stoppers, Refractories, Grinding Wheels

(*Continued from page* 100)

been hungry all his life. One night while the soldiers were sleeping, a sergeant came in and called five names of men to go on outpost duty. The duke's name was included but he was fast asleep. Hungry Joe was wide awake and in gratitude, begged the officer to take him. Old Iron Pants did not care so long as he had five men. Later heavy firing awakened the sleeping men. Four men came back and reported that the hungry one had been shot. After the war was over the duke and a friend were strolling home one night. The friend carelessly kicked a crust of bread into the gutter. The duke rescued the crust, wiped it off on a handkerchief bearing the family crest, one of the proudest in France, and placed the crust on a sidewalk seat. His friend burst into laughter. The duke said 'A crust of bread once saved my life. Do not laugh, my friend. It offends me'."

"Not bad," Bill admitted handsomely, "not bad at all. However, you don't need to go to France during the past century for a story. You can pick 'em up around town any time. I was having a small noon-time snack the other day when a man sat down opposite me and placed a bowl of soup on the table. I remarked that apparently he was taking Lent rather seriously. 'Lent, hell,' says he, 'I ain't got no teeth.' He opened his mouth in demonstration. 'I got 'em all pulled out, 18 of 'em three days ago. All I can eat now for a while is various forms of swill.' Then he laughed. 'Last night,' he says, 'after I had sucked up a mess, the wife says she had some ice cream and would I like a dish. I says sure. So she ladles out a dish and what do you think? 'Twas vanilla ice cream with nuts! Oi, Oi. All I could say was nuts to you!'

"The picture of that poor boy trying to grind nuts between a pair of sore and tender gums reminds me of an inquiry I had the other day from a man who said he would appreciate information on cast iron molds, methods and equipment required to produce the cast iron balls used in ball mills. How thick should a mold be for 4-inch diameter balls and how many cavities are practical in each mold. Would it be advisable to drop the hot castings in water. Would that treatment make them harder, or would they crack. Since the harder the balls are the better, he presumed that 100 per cent scrap could be charged in the cupola. If so what amount of steel scrap is recommended. If a ferroalloy is necessary what would I suggest, bearing in mind the availability and the cost in his locality. He admitted he had no experience in chill mold quantity production and would appreciate advice on gating arrangement.

"I told him that without a knowledge of all the conditions, and basing an opinion merely on the impression conveyed by the letter, I was tempted to suggest that he dismiss the problem from his mind. At one time any foundryman could make ball castings by pouring white iron into sand molds. Even up to the present a considerable volume of castings is made in that manner. In recent years the customers have become more exacting in their demands and will accept only castings showing maximum qualities. The balls must not chip, spall or crack and they must account for a definite tonnage of ground material. Foundrymen who specialize in the manufacture of this type of casting have developed a technique of materials and methods which cannot be acquired offhand, or from a brief written description.

"Another feature which has a direct bearing on the problem is the anticipated volume of business. A chill mold installation with the necessary mechanical equipment involves sizable capital investment and can be justified only by large production. In view of the foregoing and in the event he still proposed to venture into the new field, the following brief reference was submitted for consideration.

"The battery of molds may be set up in a straight line, or in double formation, back to back, with space between the two lines for the hydraulic or air cylinders which lock each mold before it is filled with metal, and afterward separates the halves so that the castings

(*Concluded on page* 106)

The exhibit of THE FOUNDRY *at the Buffalo convention of the A.F.A. featured an operating model of the peculiar type of foundry which has appeared frequently in the drawings accompanying the "Adventures of Bill" stories in this publication. In the illustration above, Pat Dwyer the author, and Harry Richey the artist, view with apparent approval the miniature reproduction of the two famous foundry characters who recently celebrated their silver anniversary. The display was built entirely by Mr. Richey and featured one of his special, super-duper type cupolas with many new and revolutionary attachments never before seen on cupolas in this or any foreign country. A large photograph of a foundry interior was mounted in the back of the case to add the necessary local color and atmosphere to the display.*

INTERNATIONAL MOLDING MACHINES

are busy in foundries all over the United States performing their vital part in the war program. Where High Production is important, Foundrymen specify

INTERNATIONALS

International Molding Machine Company **Chicago 8, Illinois**

If you have a foundry problem . . . call our Service Engineer
He knows the answers from practical foundry experience

Photographs taken at J. E. Gilson Company, Port Washington, Wisconsin

(*Concluded from page* 103)
may be removed. The castings fall by gravity onto a conveyor belt which takes them to the storage bins. In another type of installation the molds are mounted on a revolving table. For either installation the molds are heavy cast iron slabs mounted in pairs vertically instead of horizontally as they would be in ordinary sand mold practice. Half of each mold indentation is in one slab and the corresponding half indentation for the ball is in the other half.

"Number of cavities in each mold may vary to a considerable extent. For a 4-inch diameter ball the usual number is 12 arranged in two vertical rows with a sprue channel between and a small gate leading into each mold cavity. Each half mold is approximately 6 inches thick. This thickness of metal is sufficient to absorb and dissipate the heat while the molds are in constant use. Experience seems to indicate the molds work most satisfactorily at a temperature between 300 and 400 degrees Fahr. One half the mold is bolted firmly to the foundation. The other half is movable and slides back and forth. It is actuated by suitable hydraulic or air cylinder. In practice the molds on opposite sides of the battery are employed alternately. The ladle of metal fills the molds on one side. The castings are dumped by the time the second half of the battery is filled.

"Principal alloying agent which provides hardness through its stabilizing action on the carbides is chromium. It may be added alone to the hard iron mixture, or in combination with nickel and molybdenum or both. Typical examples of suitable compositions include silicon 0.50 per cent and chromium 0.40 per cent, and silicon 0.70 to 0.90 per cent and chromium 0.60 to 0.80 per cent. Another contains 1 to 2 per cent nickel and 0.60 to 1.50 per cent chromium. Molybdenum say around 0.35 to 0.40 per cent may be added to increase the toughness of the grinding balls. Detailed descriptions of hard iron ball manufacture appeared in THE FOUNDRY, April 15 and Oct. 1, 1926."

A.S.T.M. Meeting Held In Cincinnati

Nearly 750 materials engineers and technologists attended the 148 committee meetings held at the annual Spring Meeting and Committee Week of the American Society for Testing Materials at Cincinnati on Feb. 28 to March 4. Decision of the A.S.T.M. executive committee to advance publication of its widely used Book of Standards from 1945 to 1944 due to unprecedented demand, led many committees to meet and bring their specifications and other work as up-to-date as possible.

Feature of the meeting was a symposium on synthetic rubber which comprised 13 technical papers on applications of the product. Arthur W. Carpenter, B. F. Goodrich Co., Akron, O., was chairman of the symposium committee while J. H. Ingmanson, Whitney Blake Co., and Simon Collier, Johns-Manville Corp., were technical chairmen of the meeting. Following a buffet supper in the evening as guests of the Technical Societies Council of Cincinnati, the group was addressed by John L. Collyer, B. F. Goodrich Co., on "America's Rubber Outlook".

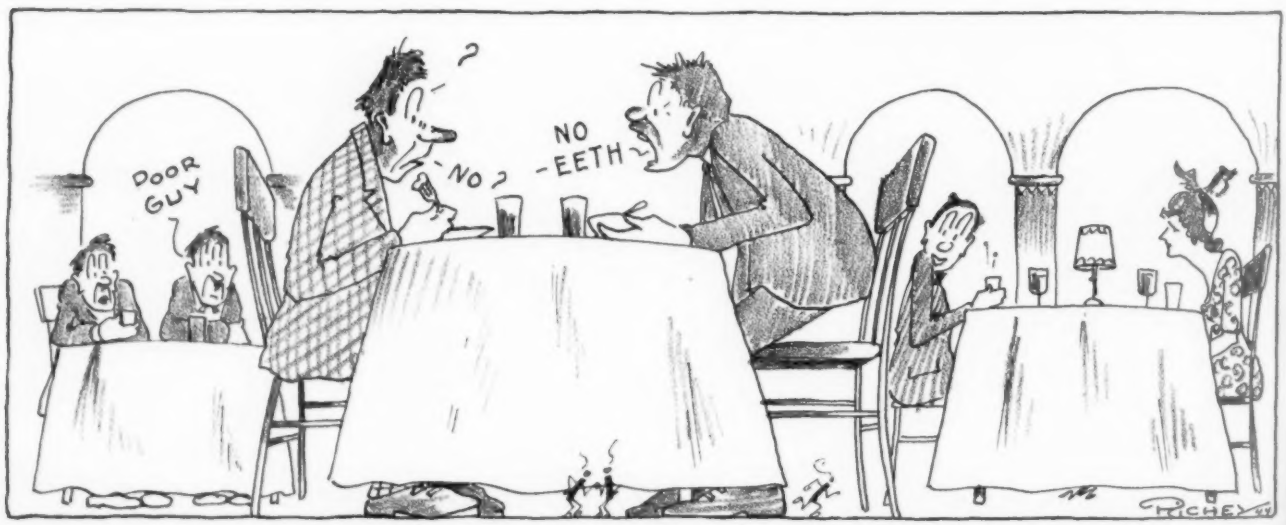
At meetings of Committee A-1 on Steel detailed consideration was given to many of the 130 specifications in its charge, and several new activities were outlined. In the field of castings for fusion welding for service at elevated temperatures, the effect of stray elements was discussed in detail, but the committee will study the matter further. An emergency provision will be carried through setting up a grade of steel casting in the carbon steel class for high-temperature service (A-95) of 65,000 pounds per square inch for tensile strength.

Chemistry provisions in the widely used chromium - molybdenum bolting grade B7 (A-193) are to be modified to be brought in line with current practice. Due to incorporation of many of the A.S.T.M. steel specifications in WPB limitation order L-211 and the present war situation, the large number of emergency alternate provisions which have been established to expedite procurement or conserve certain materials, in general are being continued.

One of the most interesting items discussed at the meeting of Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys was the preliminiary outline of the extensive new program of atmospheric tests. Plan is to use various chemical compositions in different mechanical forms exposing to three types of atmosphere for periods up to 15 years. Two other projects under way in the committee include a study of standard requirements for the 25-12 alloy castings, and preparation of a procedure suitable for stainless steel compositions of the total immersion corrosion test of nonferrous metals and alloys (B-185).

A development which will be of widespread interest to users of malleable iron castings was announced at the meeting of Committee A-7 on Malleable Iron Castings. It involves proposed specifications for pearlitic malleable iron castings. The proposed standard which will be offered for approval as tentative in 1944 provides for physical properties which will be obtainable readily under current manufacturing conditions with a special class X not covered in the so-called regular class. Properties of that particular grade would be subject to agreement between manufacturer and purchaser.

While some question arose in connection with grade 35018, which calls for a minimum tensile strength of 53,000 pounds per square inch and a 35,000-pound yield point with an 18 per cent minimum elongation in 2 inches, discussion indicated that that grade was being produced regularly by a number of foundries. Repair welding of malleable is a subject of interest because it is permitted by some agencies, and to get a clearer picture of what is involved, a study committee has been established.



A guy can be pushed just so far. Mixing hard gritty nuts with the ice cream is the ultimate nutsy limit

Industry's debt to Madame Curie grows steadily greater...

MADAME CURIE
A Portrait Made in 1929

THE physicist and the doctor knew radium first; but today it's hard at work in the metal industries.

Gamma radiography utilizes radium because it is the only radioactive material of practical importance. And gamma radiography, like x-radiography, has come along fast.

Gamma radiography, like x-radiography, is a trouble-shooter—discovering flaws in castings, for example, or in welds—frequently indicating possible repair.

Gamma radiography, like x-radiography, is a trouble-preventer. Showing up faults in pilot castings, it points the way to their elimination.

And now, gamma radiography, like x-radiography, is taking on a new job . . . it's helping to design improved postwar products. It shows the designer where his product is strong, where it's weak, where it's heavier or thicker than it need be . . . helps him reduce wall thicknesses, trim down, streamline, lighten, refine. And often gives him a choice of techniques . . . welding vs. riveting, casting vs. forging.

* * *

To help radiography do all its jobs better, Kodak supplies a line of special films, solutions, and accessories . . . and makes available the experience accumulated in 17 years of research in this field.

EASTMAN KODAK COMPANY
***X-ray Division*, Rochester, N. Y.**

The laboratory shed in which the Curies discovered radium in 1898.

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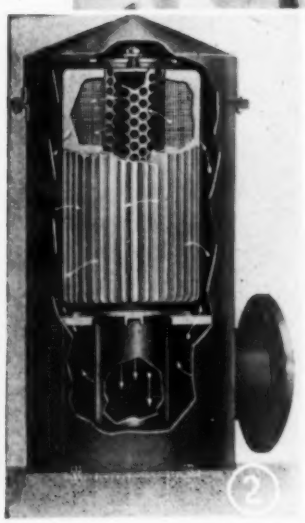
NEW EQUIPMENT & SUPPLIES

(1)—Goggle: Watchemoket Optical Co. Inc., Providence, R. I., is offering a new all-plastic goggle for general industrial use. One-piece lens is of shatterproof methacrylate that is highly resistant to pitting caused by sparks. Curved plastic frame fits the face snugly, shielding the eyes from every angle. The lens is low-cost and may be replaced easily. Reinforcement is provided by a high-brass clip at the bridge. Light weight makes it ideal for women workers. Other styles are available for wear over prescription glasses.

1

(2)—Filter: Dollinger Corp., 11 Centre Park, Rochester, N. Y., has designed its new intake filter to permit ground level installation with high level intake. It is recommended for air compressors and internal combustion engines, and may be installed and subsequently serviced at ground level—in the engine room itself, if preferred—while the air intake opening may be located elsewhere at the most suitable point. Features include radial fin construction and dry type filtering unit. Combination silencer-and-filter models are available. Servicing is simple, since the filter insert can be lifted out through a removable panel, and cleaned by brushing, by compressed air or by washing.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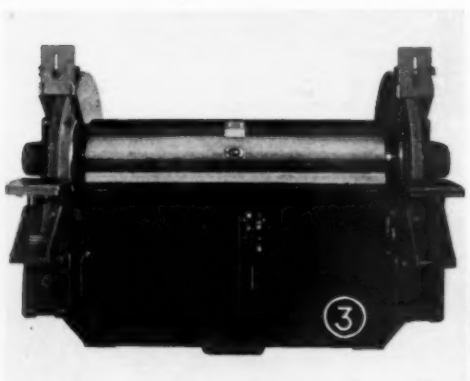
(3)—Grinder: Vonnegut Moulder Corp., 1819 Madison Avenue, Indianapolis, is offering a new variable-speed floor stand grinder for heavy duty snagging work. It is available in two sizes—using a 24 x 4 inch or 30 x 4 inch wheel. Both are basically alike, but in addition to different guard diameters and motor sizes, the two machines are equipped with different speed transmissions to develop 9000 surface feet per minute for full size wheels in each case. Automatic regulation of the v-belt variable speed control provides correct rim speed. The 24-inch machine may be equipped with a 20, 25 or 30 horsepower motor, and the 30-inch unit with a 25, 30 or 40 horsepower motor. Construction features include fitted flanges and heavy steel wheel guards, vibrationless work-rest rigidity, a hinged hood for accessibility to lubrication connections, and clean-out doors for wheel guard pockets.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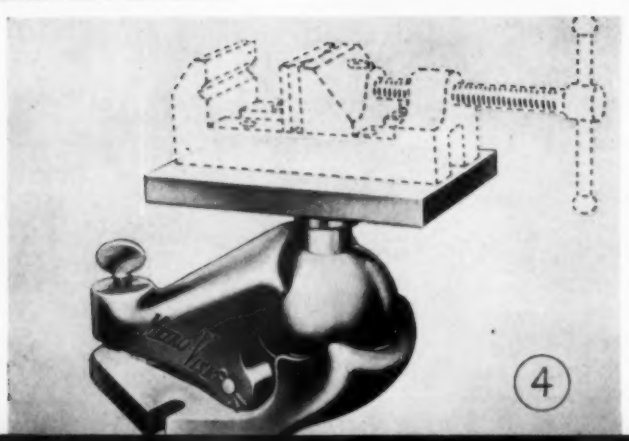
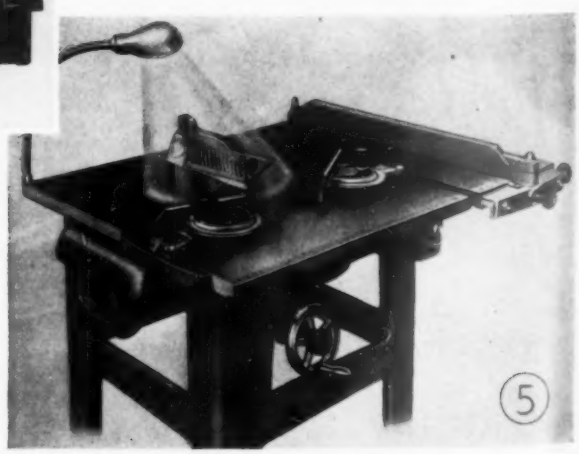
(4)—Work Holder: Metro - Vise Co., 6560 Cass Avenue, Detroit 2, has developed a tool for holding work during various types of operations on metal or wood. It is especially adapted for use in grinding, filing or checking castings, and in patternmaking. The tool consists of a face plate affixed to a ball enclosed in a socket. Babbitt jaws of the socket are released or locked in any desired position by a turn of a conveniently located thumb screw. A vise or other type of fixture may be bolted or fastened to the face plate to hold the work. The unit is made in three sizes having table dimensions of 8 x 11, 4 x 6, and 2¼ x 2¼ inches, with corresponding heights of 7¼, 5¾ and 4 inches.


4

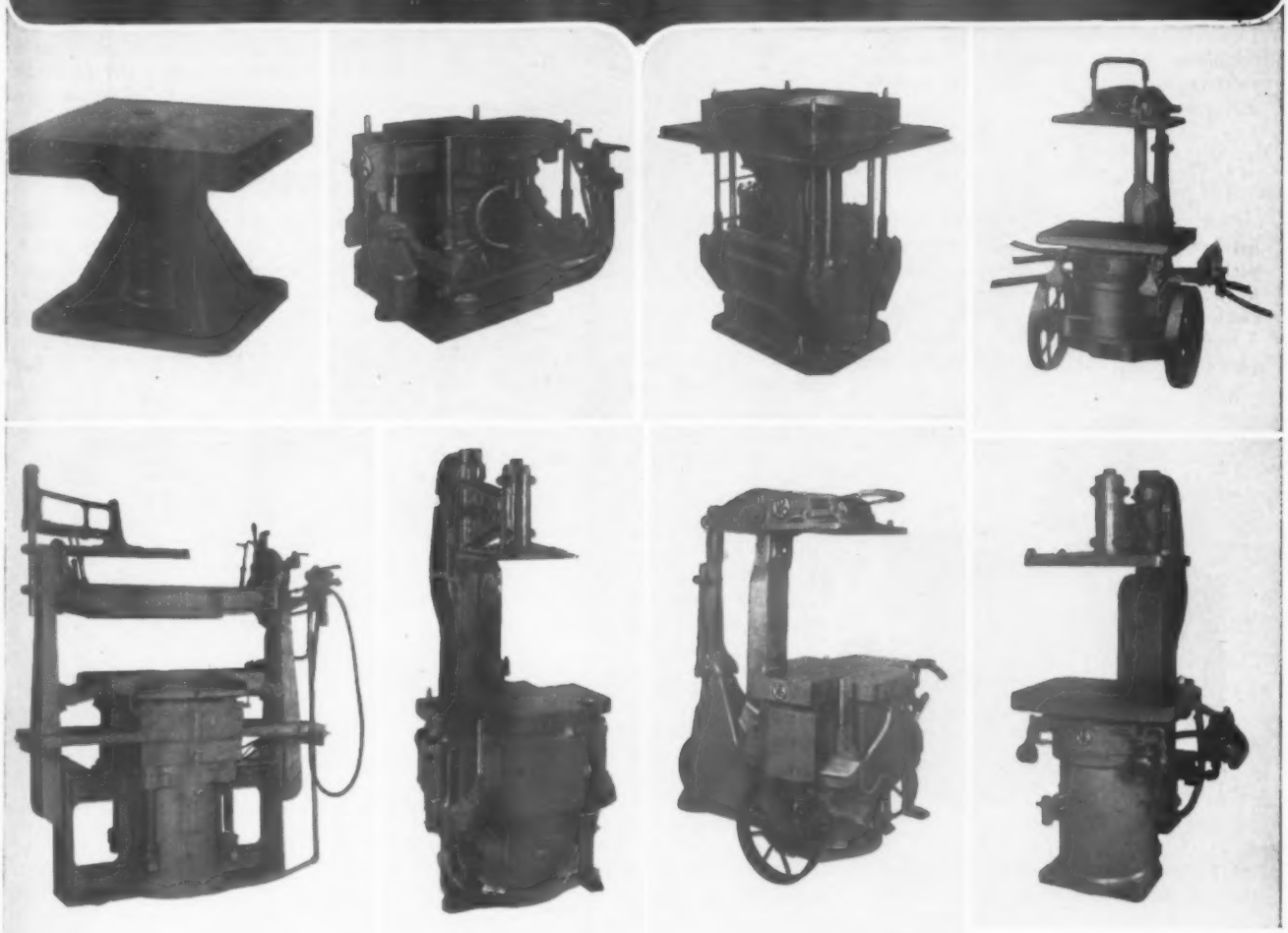
(5)—Saw: J. D. Wallace & Co., 134 South California Avenue, Chicago 12, announces an improved model of its No. 11 universal saw, to accommodate extension tables providing ripping capacities of 24, 36 or 48 inches wide. These tables facilitate ripping assembled material to accurate width after assembly, and will handle large panels. Handling time also is cut down on smaller pieces, since the larger extensions provide a convenient work table for stacking raw material or dimensioned stock after it has been sawed to size. The saw is available with 1 or 2 horsepower motor in single or three phase, geared to offset the spindle and provide a 3-inch depth of cut with 9-inch diameter blades, and 4-inch cut with 11-inch

(*Continued on page* 110)


5

SPO *Molding Machines*—

a Wide Variety to Multiply Your Productive Man Hours



New descriptive bulletins are now ready. Which type of machine are you interested in?

SPO INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

(*Continued from page* 108)

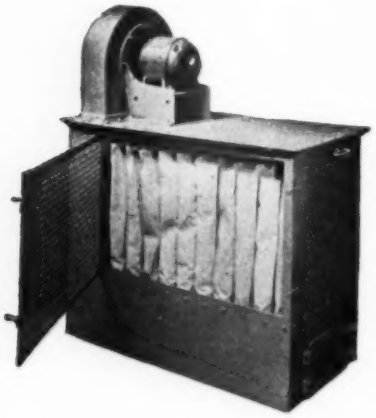
blades. The motor tilts for bevel work, the table remaining in horizontal position.

Pig Iron

Tonawanda Iron Corp., Tonawanda, N. Y., is producing a special type of pig iron which is claimed to improve grain refinement, machinability, fluidity and shrinkage of gray iron castings. Fine-grain structure of the pig iron is said to be carried over to the resultant castings. Likewise the increased fluidity and lower shrinkage aid in casting thick and thin sections, reduce scrap losses, and provide easier machining.

Dust Collecting Units

Northern Blower Co., 6502 Barberton avenue, Cleveland 2, is offering a complete line of bag-type portable dust collection units ranging upward from 300 cubic feet per minute and having up to 8 inches static pressure at the fan. Employing cylindrical bags with dust laden



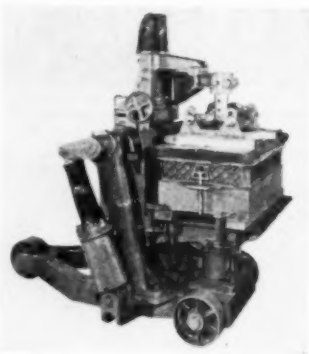
air entering at the bottom and flowing upward inside the bags against gravity, Norblo portable units are designed for light dust loads and intermittent service. They are equipped with ¾ to 3-horsepower motors. The bags are cleaned by hand shaking. For wet or moist grinding or polishing or where lint or fibrous fabric is produced, a new line of impingement and filter type small units is available, ranging from 500 to 1000 cubic feet per minute capacity and with 8 inches static water pressure at the fan.

Rust Preventive

E. F. Houghton & Co., Philadelphia, announces a combined rust preventive, cleaner and fingerprint neutralizer for use in internal plant protection of steel parts. It is not intended to remove rust, but to neutralize causes of corrosion, particularly acid perspiration from workers handling the parts. It also is effective in protection against corrosion caused by chemical atmosphere, fumes, etc., or high humidity.

Molding Machine

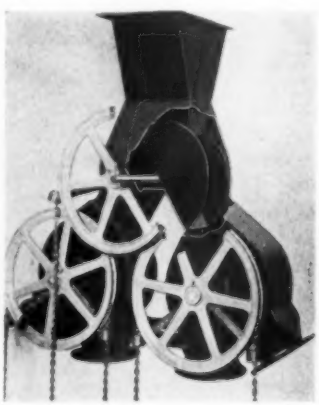
Johnston & Jennings Co., 867 Addison Road, Cleveland 14, has developed a new portable jolt rollover pattern draw molding machine designed for work requiring absolute accuracy in ramming and drawing. It is claimed the machine meets present foundry specifications and is ideally adapted to make the intricate molds re-



quired in the aircraft and other precision industries. The machine features an automatic air operated clamp and equalizer. It is of open end construction and easily is adjusted for flasks and coreboxes of various sizes and heights. It has a positive valveless jolt, free from vibration and rebound, and two rollover cylinders with oil dash pot control that provides smooth operation. Table size is 24 x 30 inches and the pattern draw is 12 inches. Maximum height of flask, pattern and bottom board is 31 inches.

Flop Gate

C. O. Bartlett & Snow Co., 6201 Harvard Avenue, Cleveland, is introducing a modification of its inverted "Y" multiple outlet flop gate, that is said to prevent any leakage down the wrong leg of the gate, even when handling dusty or powdery materials. It employs a pivoting chute having semicircular sides, instead



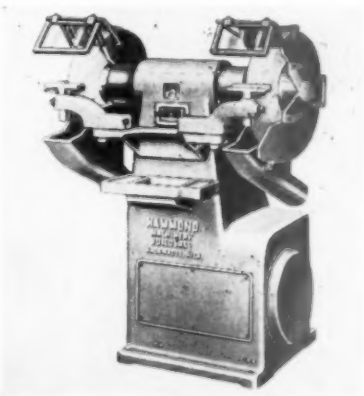
of a pivoting plate. Material passing through the gate is wholly contained within the chute and has no opportunity to pass out the wrong leg. Chutes are operated with a chain and chain wheel, and are held in position by gravity until changed. Gates have self-damming spouts to regulate the flow from one, two, or more outlets in any capacity desired.

Respirator Filters

Mine Safety Appliances Co., Thomas and Meade Streets, Pittsburgh 8, has developed three types of respirator filters, each of which has its own distinctive color for ready identification. The color shows through the transparent filter containers and permits inspection at a glance of the type employed, without removal from the respirator. This helps to assure that the user is employing the correct type of filter for protection against the particular dust or fume condition to which he is exposed.

Magnesium Grinder

Hammond Machinery Builders Inc., Kalamazoo, Mich., announces newly equipped grinders for grinding magnesium. The 10, 12 and 14-inch grinders (Series RW) are equipped with heavy plate wheel guards which have direct exhaust outlets for connection to dust



collecting system. Machines also are equipped with explosion-proof electrical equipment. Other Hammond grinders can be similarly equipped. Complete equipment of the type illustrated include: Mounting for any 1, 2 or 3 horsepower motor in the base; multi-v-belt driven spindle; explosion-proof electrical equipment; hinged wheel guards of steel plate with exhaust connections and spark deflectors; adjustable work rests; tool tray and removable water pot. Wheels and eyeshields shown are extra.

Vernier Gage

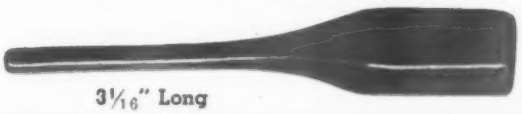
Continental Machines Inc., 1301 Washington Avenue South, Minneapolis, announces a new vernier gage for making precision measurements in increments as fine as a ten-millionth of an inch. It consists of two gage blocks having a precision taper on their mating faces. When the taper faces of two blocks are wrung together with their taper index marks coinciding, the blocks form a gage block whose height is 0.700 inches. One block

(*Continued on page* 113)

KOOLHEAD FOUNDRY CHILL NAILS

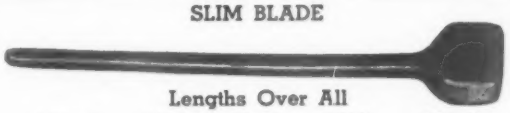
HOT FORGED — COLD FINISHED

GIANT HEAVYWEIGHT HEAD



3 1/16" Long

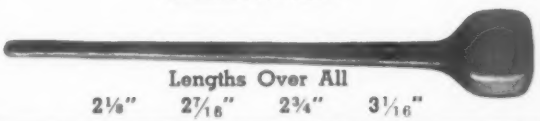
SLIM BLADE



Lengths Over All

1 1/16" 2 1/8" 2 7/16" 2 3/4" 3 1/16"

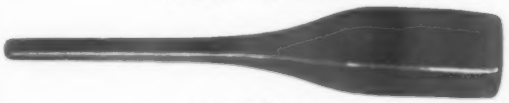
MEDIUM BLADE



Lengths Over All

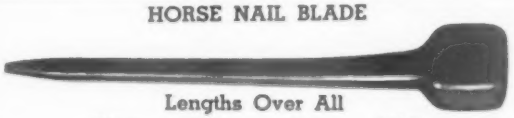
2 1/8" 2 7/16" 2 3/4" 3 1/16"

JUMBO PATTERN



3 1/16" Long

HORSE NAIL BLADE



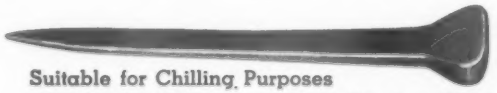
Lengths Over All

2 1/8" 2 3/8" 2 5/8" 2 7/8"

LOK - SAND
OR "SCAB" NAIL
Straight or Bent
to Any Angle

3 1/16" Long

HORSE NAIL SECONDS



Suitable for Chilling Purposes
But Not For Shoeing — Sizes No. 5 to No. 11

HORSE NAIL STUBS

Made in Lengths
1" 1½" 2"

You saw them on display at the Third War Foundry Production Congress Show Buffalo last month, and we are pleased to report that—

"Koolhead" demand has gone sky-high

So the Old Adage—"*SEEING IS BELIEVING*" should influence those not fortunate enough to attend that hot-forged cold-finished "KOOLHEAD" Foundry Chill Nails really is the answer to their chill nail problems—

WRITE FOR SAMPLES

HOT FORGED COLD-FINISHED "KOOLHEAD" CHILL CHAPLETS ARE MADE TO YOUR INDIVIDUAL SPECIFICATIONS — SEND US YOUR PRINTS OR DETAILS FOR PRICES

We are also manufacturers of . . .

WOODRUFF KEYS, TAPER PINS, DOWEL PINS, MACHINE KEYS, COTTER PINS AND OTHER STEEL SPECIALTIES . . . STANDARD HORSE SHOE NAILS ARE KNOWN AND USED AROUND THE WORLD

ESTABLISHED 1872 STANDARD FORGED INCORPORATED 1886

STANDARD HORSE NAIL CORP.

NEW BRIGHTON, PENNA.

How to Put Your Grinders "in the Pink"

Here's what the new *blue flash* trademark on Bay State grinding wheels means—

Fast. Only Bay State offers fractional grades—three degrees of hardness in a single grade. No more trouble due to a wheel being *a trifle* too hard or *a trifle* too soft. You can match the job requirements *exactly* — to get FASTER production.

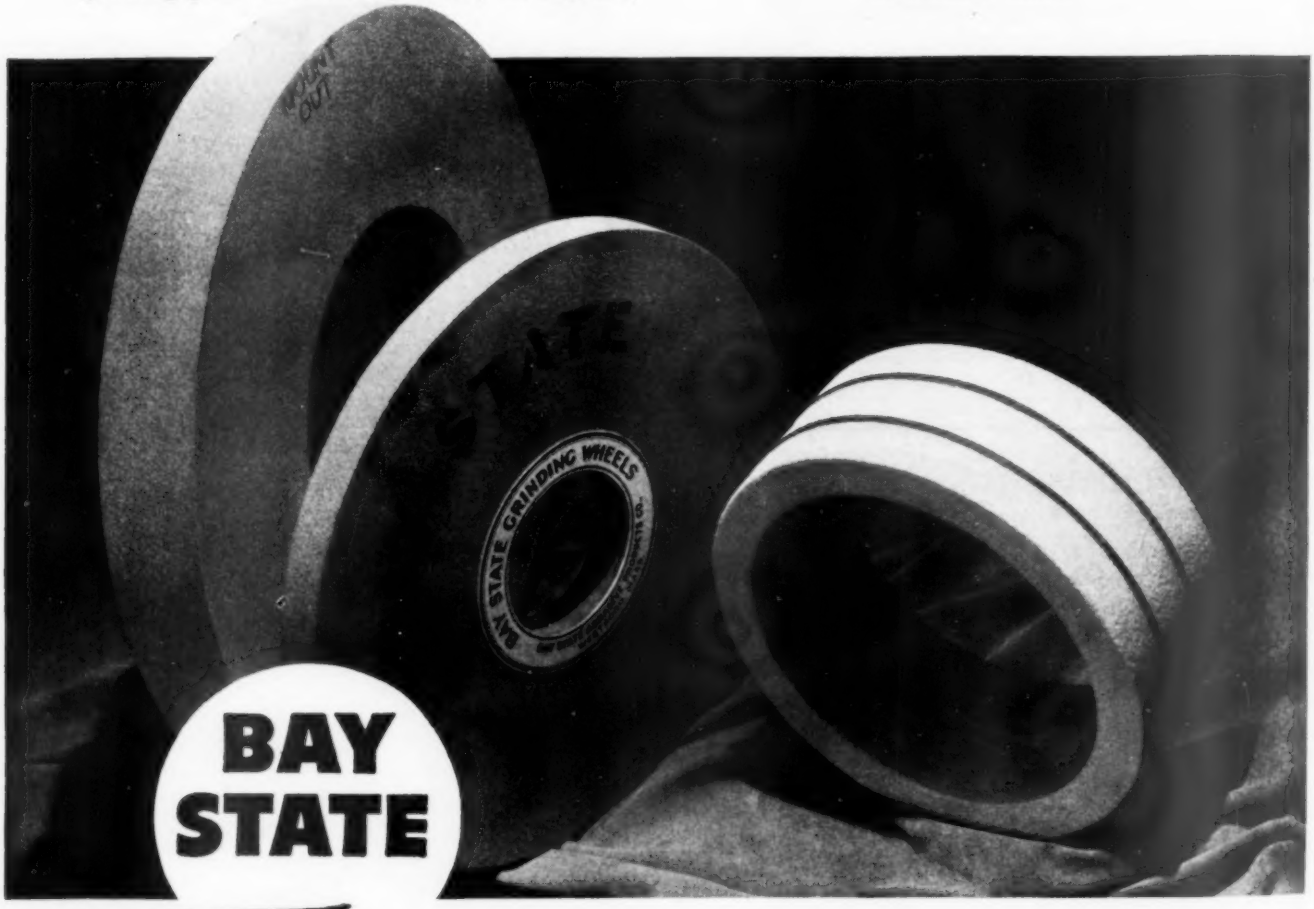
Cool. Bay State's own development in bonding — H9 vitrified (recommended for most surface and centerless grinding) — has *extra* strength, so less is needed to hold the abrasive grains. Wheels can be more porous, COOLER-cutting.

Bay State also offers a stronger guarantee of the same *results every time.* Fractional grading plus controlled porosity (8 degrees) permit very close duplication once a satisfactory wheel has been selected.

Bay State leadership in quality has been mounting during the war. Its acknowledged reputation for the finest honing and superfinishing stones, has extended rapidly into all the lines represented in the drawings below. And Bay State engineering offers specialized services to help you determine the exact wheel for your needs.

Make a test to determine if fractional grading plus other Bay State advantages won't give you better results. The first step is writing us for Bulletin A.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



BLUE Z FLASH GRINDING WHEELS *FAST and COOL*

HONING AND SUPERFINISHING STONES · CUT-OFF WHEELS · INSERTED NUT DISCS · AND CYLINDERS
PORTABLE SNAGGING WHEELS · MOUNTED WHEELS · AND POINTS · GRINDING WHEELS

(*Continued from page* 110)

is graduated into ten equal parts between the index graduations. By sliding this block to the right or left, the taper causes the height of the vernier gage to be increased or decreased one ten millionths for each graduation.

Industrial Clothing

B. F. Goodrich Co., Akron, O., is offering industrial clothing coated with rubber, synthetic rubber or other synthetic materials. Included in the new line are firemen's and policemen's coats, general purpose work coats, industrial coats and worker's leggings, work jackets, pants and hats. WPB regulations govern the amounts of natural, reclaimed or synthetic rubber which can be utilized.

Tensile Tester

W. C. Dillon & Co. Inc., 5410 West Harrison Street, Chicago 44, announces a new design of its portable tensile tester. It weighs 132 pounds and is 35 inches tall. Starting at 0-250 pounds the unit

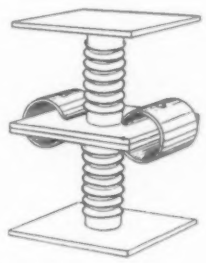
has seven intermediate and interchangeable indicators up to 0-10,000 pounds. A new holder design for standard v-wedge serrated grips is said to permit especially rapid specimen insertions and removal. The machine is hand driven but can be motorized, and is available with a floor cabinet containing specimen space and room and shelf for motorizing.

Dilatometer

Bristol Co., Waterbury, Conn., announces a new model direct-reading dilatometer for recording temperature-dilation changes and temperature-time changes simultaneously in ink during heating and cooling cycles of metals and many other materials in solid form. The two records are made on a chart with rectangular co-ordinates for ease of interpretation and filing. The split furnace, designed for temperatures to 2500 degrees Fahr., can be pulled away from the sample for quenching or cooling without disturbing the record, and the inside dimensions permit use of a sample up to 1⅝-inch diameter by 5 inches long.

Chaplet Clip

Smith & Richardson Mfg. Co., Geneva, Ill., is introducing a chaplet clip, designed to hold two or more chaplets together. It is said to be easy to use, merely being



clipped on as shown in the accompanying illustration. In this way, chaplets when stacked are prevented from shifting or falling off during the mold closing operation.

Fluxed Solder

National Lead Co., 111 Broadway, New York 6, is offering a new type of fluxed wire solder which contains flux in longitudinal grooves on the surface rather than in the conventional core. Since the flux is outside rather than inside, it liquefies and flows onto the work before the solder melts, thereby promoting thorough fluxing. It also is said to guarantee an unbroken flow of flux. The new product, which contains a recently developed special flux, comes in the same diameters as regular cored solder.

Grinding Wheel

Norton Co., Worcester, Mass., announces that grinding wheels made of its 57 alundum abrasive now are available for general use. Used in wheels for snagging, cylindrical grinding, centerless grinding, and internal grinding,

applications previously had been limited, because of production facilities, to critical war jobs. The wheels are available in the company's patented vitrified bond as well as in regular vitrified bond in a wide range of grain sizes, grades and structures.

X-Ray Film Solution

St. John X-Ray Service Inc., Long Island City 1, N. Y., is offering a solution for intensifying and bringing out hidden details in all types of x-ray film. The fully processed and washed films are immersed in the solution. This treatment can take place in daylight, and requires from a few seconds to 2 minutes when the solution is fresh. Longer time is necessary after the solution has been used for a time. If the negative becomes overintensified it may be reduced or entirely removed by immersing the film in plain hypo solution. Use of the product is said to cut radium exposure time in half.

Portable Heating Tank

Youngstown Miller Co., Sandusky, O., in addition to building stationary heating tanks in various sizes, has designed special units such as the portable tank illustrated. It consists of an insulated

tank equipped with electric heaters, a motor and pump for circulating the oil, thermostats for maintaining oil temperature within certain limits, electric controls and valves—all mounted on casters.

Protective Clothing

Resistoflex Corp., Belleville, N. J., has developed safety clothing made of a vinyl resin known as compar, which is impervious to organic solvents and also is unaffected by many of the inorganic solvents. These garments include gloves, hoods, aprons, smocks and sleeve guards. Shoes also may be coated completely with solutions of the same resin.

Electrode Holder

General Electric Co., Schenectady, N. Y., announces a new helium-shielded arc-welding electrode holder for manual operation. It may be used with either helium or argon gas, and is specially designed for use in welding light metals, such as magnesium and its alloys, where precise heat control and protection from

oxidizing effect of the air are required. It can also be used in welding such metals as aluminum and stainless steel. The gas nozzle is designed to give maximum coverage with minimum gas consumption, and to avoid obstructing the operator's view of the arc.

Compressor Control

Johnson Corp., Three Rivers, Mich., has developed a new control for protecting water-cooled compressors against overheating and for preventing waste of water. It consists of a sight flow fitting, mounted in the water discharge pipe of the compressor, which serves as a holder for a metal electrode. When pressure in the receiver falls below the predetermined level, the pressure switch on the receiver opens a solenoid controlled valve to admit cooling water. Compressor is not started until water flows through it and into the sight flow, completing circuit with the electrode. Should the water supply fail the compressor will not start, or if operating will be stopped. Similar protection is provided when the control is applied for use on unloading compressors.

Grinding Wheel Mount

Sterling Grinding Wheel Division, Tiffin, O., is offering a new mount, called the Easymount, and wheels for grinding tungsten carbide. A wheel is fastened quickly and securely into the mount and

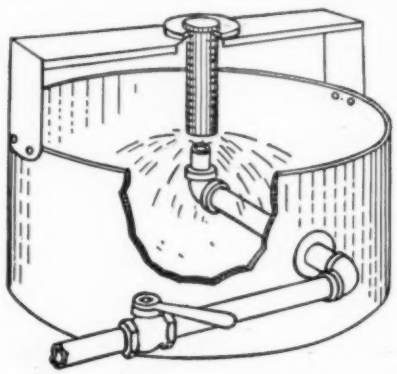
is replaced easily when worn. Both the mount and wheels are available in sizes to fit various types of grinders. Wheels are supplied in coarse grain for roughing, medium for semifinishing, and fine for finishing.

Electrode

Air Reduction Sales Co., 60 East 42nd Street, New York, announces a new coated aluminum-bronze electrode, No. 100. A shielded arc electrode, it also can be used as a filler rod in carbon arc welding, and is said to be superior to standard manganese bronze in corrosion resistance, with equal strength, hardness and ductility. The rod is recommended for welding most bronzes, malleable and cast iron or steel, also for welding dissimilar metals, such as cast iron to brass, steel to malleable, or any two metals weldable with aluminum-bronze. Other applications include welding conforming to Federal Specification QQ-B-726b, and Navy Specification 49-B-3e. Stock sizes are 1/9 to 3/16-inch in 14-inch lengths and ¼-inch in 18-inch lengths, with sizes from 5/16 to ½-inch in 18-inch lengths available on special order.

Quench Test Fixture

Claud S. Gordon Co., 3000 South Wallace Street, Chicago 16, is offering a new fixture, with accessory tongs, for facilitating use of the Jominy end quench



hardenability test for treatment of NE steels. The fixture is simple, as shown in the accompanying illustration, and is said to be a time saver in this type of testing.

Sound Reproducer

Executone Inc., 415 Lexington Avenue, New York 17, is offering a new model duo-directional baffle reproducer to be used in conjunction with its music and voice-paging systems. It is especially engineered for clear tone reproduction over a broad sound range, and is recommended for plant broadcasts of planned music and employe-interest programs. It is designed for use in any size area where up to medium noise conditions exist and wide angle distribution of voice and sound is desired. Dimensions are 17 inches wide, 10½ inches deep and 23 inches high.

Floor Sweeper

Stearns Magnetic Mfg. Co., 662 South Twenty-Eighth Street, Milwaukee 4, announces a portable magnet for picking up light scrap from plant floors. It consists of a permanently magnetized drum mounted on a chassis equipped with antifriction bearings and requiring little more effort to operate than a lawn mower. The magnetic drum revolves with an 18-inch working face.

Infra-Red Lamp

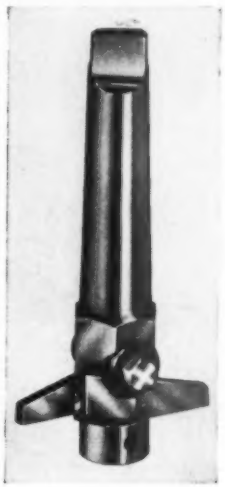
Wabash Appliance Corp., 335 Carroll Street, Brooklyn, N. Y., announces a new construction of its infra-red heat lamp which permanently locks the base and bulb against high temperatures of infra-red tunnel use. The construction, using no cement or strap, includes a base lining made with special protrusions fitting tightly into indentations in the neck of the bulb and locked in position by special crimping of the metal base. A ceramic heat reflector disc replaces the mica disc formerly used.

Abrasive Identification

Bay State Abrasive Products Co., Westboro, Mass., has adopted a new identification mark, consisting of the wording "Blue-Flash" plus a symbol of a lightning flash, for the complete line of its abrasive products. This mark will appear in blue to emphasize further the name and provide easy identification.

Adjustable Counterbore

Robert H. Clark Co., 9330 Santa Monica Boulevard, Beverly Hills, Calif., announces an adjustable blade counterbore and spotfacer which permits adjustment to any diameter within the broad limits of the tool, instead of employing a group of fixed-diameter bits interchangeable on a standard shank. Nine available sizes cover all diameters from ¼-inch to 5½ inches and provide interchangeable



pilots from 3/16-inch to 5¼ inches in diameter. Cutting blades are removable for easy resharpening or replacement. Interchangeable pilots are designed so that burrs are prevented from forming at the end of the pilot hole.

Ladle Lining

Mexico Refractories Co., Mexico, Mo., has developed a new slag resistant, monolithic type lining for ladles which is claimed to possess a high resistance to spalling, abrasion, and slags. Comprised of a Missouri super-quality refractory combined with a special graphite chemically sealed into the mixture, the material is designed for lining foundry and metallurgical furnaces and ladles. It is shipped in putty form in 100-pound paper cartons and 500-pound steel drums.

Mexaloy Super Refractory Saves Linings and Equipment

Tough, non-fusible protective lining for ladles, spouts, runners and cupolas

Mexaloy is the ideal material for protecting refractory linings of cupolas, ladles, runners and spouts in both foundries and steel plants. Mexaloy makes the body containing it highly resistant to sudden, violent temperature changes and thus avoids spalling and cracking of the refractory. Practically infusible, it will not melt or change its character under the action of molten metal. Neutral and chemically inert, Mexaloy's presence insures resistance to fluxing and corrosive action by molten metals and slags. It provides a low-friction, surface which allows no foreign body adherence.

Mexaloy is extremely easy to apply. Mixed with clay, ground fire brick and water according to a simple formula, the resulting mixture is easily applied by tamping. Linings containing Mexaloy last longer. For example, in the spouts of open Hearth furnaces where the usual loom layer has to be replaced after every one or two heats Mexaloy linings invariably last more than 10 heats—sometimes as many as 30. In Foundry cupolas Mexaloy linings last longer and improve metal quality.

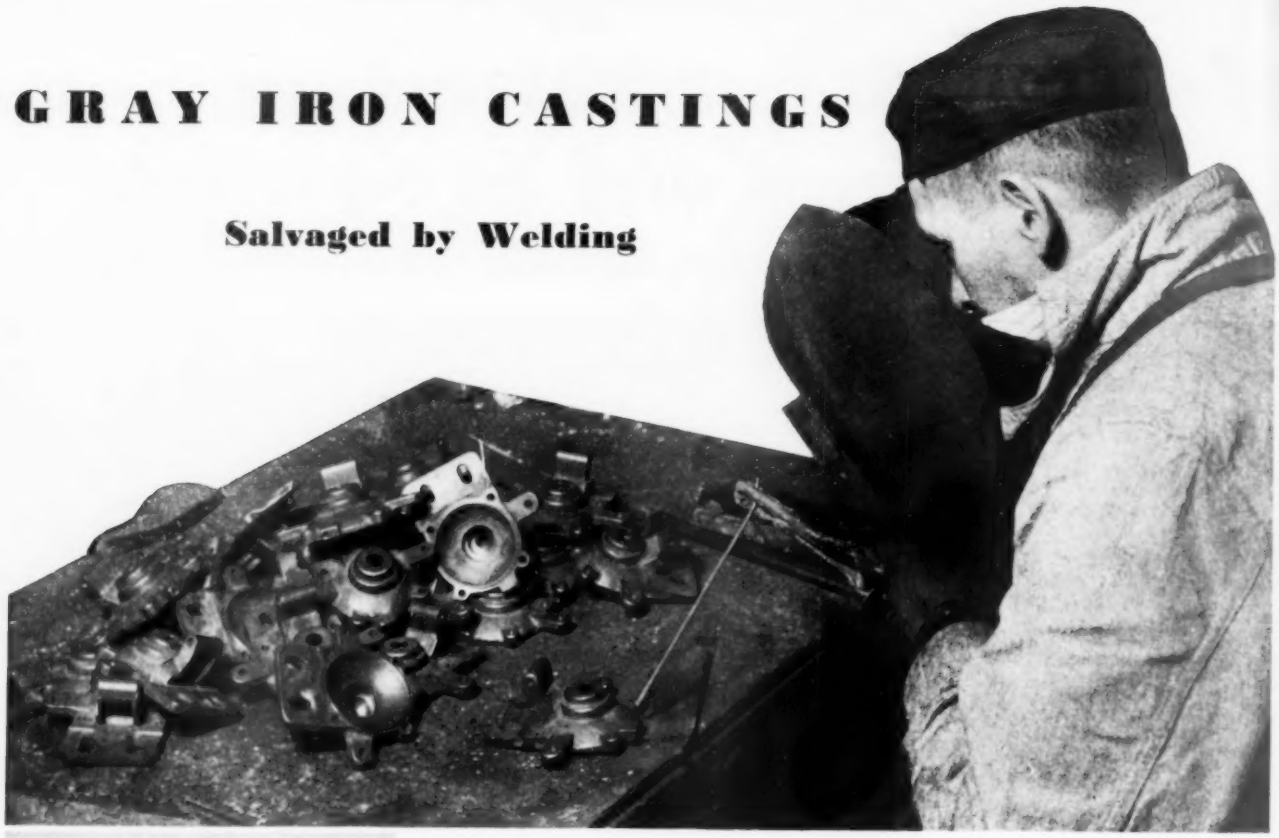
To greatly reduce "shut downs" in your steel plant or foundry due to refractory replacements, it will pay you to use Mexaloy. Write today for further information.

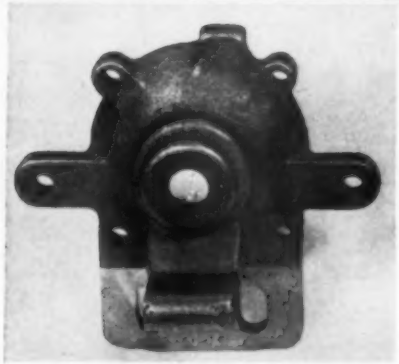
Mexaloy

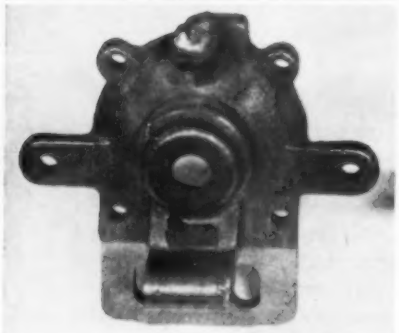
THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

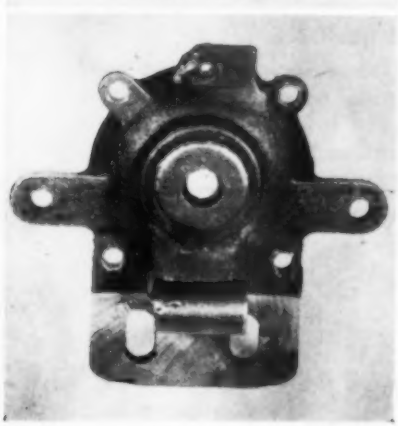
GRAY IRON CASTINGS

Salvaged by Welding









NEW development in metallic arc welding of particular interest to cast iron foundries is a special procedure for obtaining arc deposits on gray cast iron which can be machined through the line of fusion. Due to the low cost of the operation, it has been found economical from a cost standpoint. In addition defective castings can be reconditioned quickly for immediate use, thus avoiding interruptions to production in many cases.

Although some weldable defects are found by inspection immediately after the castings have been made, it frequently is the case that more important savings are realized by correcting defects which are revealed at some stage of the machining operations. A third case arises when changes in design are made after the castings have been poured.

A typical example of the latter occurred recently in a large plant after several hundred small cast iron end plates had been finish machined and were ready for assembly. A sudden change in design made it necessary to increase the size of a lug in order to drill one more hole for a connecting screw. Due to the size and shape of the piece, it was not practical to build up the lug by using any welding process which would cause appreciable spread of heat through the casting, because such procedure would cause enough warpage to throw the machined surfaces out of alignment. It also was necessary that the deposited metal be machinable throughout, including the line of fusion, because the final finishing included both drilling and tapping through the fusion zone.

Fig. 2 shows the shape of the casting and some of the machine work which had been done before the need for a change in design was discovered. There was machining on four sides, seven holes were drilled, and the inside was bored on two diameters. Therefore, a considerable investment in machining time was represented although each casting weighed less than 2 pounds.

The metallic arc welding procedure which was used to salvage these practically finished parts was an application of a special welding rod developed by C. E. Phillips & Co., Detroit. It is a fabricated, flux-coated electrode applicable by alternating current or by direct current with reverse polarity (electrode positive). On this job the ⅛-inch size was used, with 115 amperes direct current. Preparation of the work was negligible because the castings were clean and free of scale. However, it should be noted that perfect cleanliness of the work is necessary to prevent contamination of the deposit by any material which might have a tendency to cause hardness on cooling. Set-up involved only laying the piece on the welding table to which the ground lead of the welding generator was attached. A small piece of ¼-inch copper

(*Concluded on page* 130)

Fig. 1 (*above*)—*Setup for welding operation is quite simple.* *Fig.* 2 (*left top*)—*View of casting after machining but before change in lug size.* *Fig.* 3 (*left center*)—*Size of lug increased by metallic arc welding procedure.* *Fig.* 4 (*left bottom*)—*Welded part after tapping*

NEED EXTRA "HANDS"
in your core room?

Photo—Harold M. Lambert

WE DON'T PRETEND TO KNOW OF ANY IDLE CORE MAKERS THAT YOU CAN HIRE . . . BUT, WE DO SUGGEST

ROYAL BINDER

to Save Time • Labor • Materials

1. **INCREASES OVEN CAPACITY**—Royal bakes quickly—saves oven time.
2. **SAVES OIL**—Replaces part of your oil—cuts costs.
3. **ADDS GREEN STRENGTH**—Makes green core sand easy to handle.
4. **REDUCES SMOKE**—The more Royal, the less smoke.
5. **SAVES NAILS**—In facing sands it often eliminates them.
6. **WORKS SMOOTHLY**—Your coremakers will like this feature.
7. **SAVES CEREAL BINDERS**—Up to 50% —without sacrificing green strength.
8. **HAS GOOD PASTING STRENGTH**—Pastes joints as strong as the core itself.
9. **IS AN EXCELLENT FACING ADMIX**—Reduces cutting and scabbing—peels easily.
10. **ENJOYS INCREASING USER DEMAND**—Constantly increasing repeat orders.

Try It in Your Foundry Soon!

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • MINNEAPOLIS • NEW YORK • ST. LOUIS • RICHMOND, VA. • Mines UPTON, WYO.

activities of foundry

GROUPS

Central Indiana

APRIL 3 meeting of the Central Indiana Chapter of the A.F.A., attended by about 75 members and guests, included two speakers on its program. Carl Joseph, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich., discussed the production of pearlitic malleable iron, while Fred Carl, Delco-Remy Division, General Motors Corp., Anderson, Ind., described that company's aluminum foundry.

Mr. Joseph stressed the importance of continuous and accurate control of each ingredient and operation in the process of making pearlitic malleable, including the raw materials from which the pig iron is produced. Mr. Carl used slides to describe the large and modern Delco-Remy aluminum foundry.

Election of officers of the chapter for the coming year named the following: Chairman, Harold H. Lurie, chief metallurgist, Cummins Engine Co., Columbus, Ind.; vice chairman, R. S. Davis, manager, National Malleable & Steel Castings Co., Indianapolis; treasurer, Harold Henninger, assistant foundry superintendent, International Harvester Co., Indianapolis; secretary, Robert Langsenkamp, secretary, Langsenkamp-Wheeler Brass Works, Indianapolis.

The following were elected directors with terms expiring in 1947: Richard Bancroft, W. L. Seymour, Lloyd Davis and William Zigmueller. William Zeunik was elected a director with term expiring in 1946.—*Robert Langsenkamp, secretary.*

Toledo

IN THE unavoidable absence of President R. T. Jansen, Charles Carson, National Supply Co., served as chairman at the March 28 meeting of the Toledo Chapter of the A.F.A. and introduced the speaker Pat Dwyer, engineering editor, THE FOUNDRY, Cleveland. With the aid of a number of slides the speaker discussed the subject of gates and risers from a practical shop viewpoint in their application to a wide variety of castings. Fundamentally, he pointed out the production of a casting is apparently a simple process, but as every foundryman knows it is the result of highly specialized and skilled effort. Many details enter into the process and many factors are involved. Unless every detail is observed faithfully and unless every factor co-ordinates and synchronizes with the others in orderly sequence, the casting will not meet the purpose for which it was designed.

In practically every other method of fabrication the workman can see the desired object gradually taking shape. The foundryman can exercise the greatest skill and care in the preparation of a mold, but there are so many potential hazards, that he cannot guarantee in advance that any mold will produce a perfect casting.

After a brief discussion of the paper, a very amusing and to the uninitiated, a devastating attack on the integrity of the secretary-treasurer was presented by a carefully coached block of revolutionists. Attempted defense of the accused was singularly weak and ineffective. He was honorably exonerated and peace was restored when a bevy of waiters appeared on the scene bearing beer and pretzels. Before the meeting adjourned the chairman appointed a committee to arrange details for the annual summer outing of the chapter in June.—*R. B. Bunting, secretary-treasurer.*

Canton

INSTALLATION of the twenty-sixth chapter of the A.F.A. was held in Canton, O., on March 30 at the Elk's Club with over 100 members and guests present to witness presentation of the "baby rattle" by Norman F. Hindle, assistant secretary, A.F.A., Chicago, to newly-elected Chairman Karl F. Schmidt, United Engineering & Foundry Co., Canton. Mr. Hindle expressed regret that Robert E. Kennedy, secretary, was unable to be present to perform that duty.

The new organization, which will be called the Canton District Chapter, had its inception last November, and its organization meeting in January. Membership of the chapter will be drawn from Stark, Wayne, Columbiana, Tuscarawas, Holmes and Carroll counties and sections of Summit, Ashland, Knox, Coshocton, Harrison and Jefferson counties.

Due to the wide distribution and lack of one concentrated industrial center, the nominating committee under C. B. Williams, chairman, suggested division of the territory into East, Central and West areas with recommendation that officers and directors be selected to represent each. The following slate of officers was proposed and elected: Chairman, Karl F. Schmidt, United Engineering & Foundry Co., Canton; secretary, George M. Biggert, United Engineering & Foundry Co.; treasurer, Otis D. Clay, Tuscora Foundry Sand Co., Canal Fulton, O.; vice chairman East area, H. G. Robertson, American Steel Foundries, Alliance, O.; vice chairman West area, A. H. Lankford, Wooster Products Co., Wooster, O.

Directors East area: W. W. Hoover, Machined Steel Castings Co., Alliance, O.; Louis Way, Columbiana Foundry Co., Columbiana, O., and John R. Kerr, Deming Co., Salem, O. Directors Central area: I. M. Emery, Massillon Steel Casting Co., Massillon, O.; H. E. McKimmey, Carnegie-Illinois Corp., Canton, O., and F. J. O'Mara, Canton Malleable Iron Co., Canton, O. Directors West area: C. F. Bunting, Pitcairn Co., Barberton, O.; Edward H. Taylor, F. E. Myers Co., Ashland, O., and Charles Reyman Jr., Atlantic Foundry Co., Akron, O.

Chairman Schmidt appointed the following committee chairmen: I. M. Emery, program; H. G. Robertson, membership and attendance; A. H. Lankford, constitution, by-laws and policy; H. E. McKimmey, apprentice training; Edward H. Taylor, educational; C. F. Bunting, entertainment; W. W. Hoover, audit and budget; George M. Biggert, publicity, and Charles Reyman Jr., regional meeting. Members Lankford and Robertson were appointed chapter delegates to the Buffalo convention.

Harry W. Dietert, Harry W. Dietert Co., Detroit, was the principal speaker, and discussed "Behavior of Core and Molding Sands at Pouring Temperatures" which he illustrated with motion pictures taken of sands under high temperature conditions. He described results obtained through changes in sand mixtures to eliminate faulty castings, and stated that much still is to be learned about sands as only the surface has been scratched at present. Following Mr. Dietert's talk a lively and interesting discussion period developed.—*George M. Biggert, secretary.*

Birmingham

JOHN WAKELAND, general foreman, McWane Cast Iron Pipe Co., Birmingham, discussed "Magnesium Castings" at the March 17 meeting of Birmingham District Chapter of the A.F.A. The use of magnesium in making castings is comparatively new in this district, the McWane Co. being the only processors here. Mr. Wakeland followed through with the processing of this material into the finished castings in a very interesting and instructive manner. Foundrymen present gave close attention to the speaker, and plied him with many questions at the conclusion of his talk.

He pointed out that magnesium is very inflammable, and great care must be taken to avoid fire and explosions, with possible injury to employes and property, particularly since fire from this material

(*Continued on page* 120)

BASKET!

In basketball—the country's most popular game—it's teamwork that wins. Profitable casting production takes teamwork, too—good men plus good methods and good materials.

MOGUL CEREAL BINDER . . . *saves binder costs;* reduces baking time and cleaning costs; increases oven capacity and core production . . . PRODUCES QUALITY CASTINGS.

MOGUL is a perfect Green Bond, which increases permeability in cores and bonds. MOGUL can be used in cores when both green and dry strengths are required.

MOGUL works with core oil, because it decreases drying time, and produces smooth cores. MOGUL works perfectly with pitch or resin, too, because cores can be handled while still warm. MOGUL is widely used with sharp sand.

Team up with MOGUL and KORDEK — you can depend on them.

KORDEK

Kordek is a perfect DRY BOND. Kordek can be used in smaller proportions than most dry binders. Produces better castings with fewer discards.

CORN PRODUCTS SALES CO. **17 BATTERY PLACE NEW YORK 4, N. Y.**

(*Continued from page* 118)

is very difficult to extinguish. Mr. Wakeland pointed out that the supply of magnesium is practically inexhaustible, and offers a wide and unexplored field for development in postwar civilian industry.

W. Carson Adams, chairman, presided at the dinner and the business session following. C. S. Whittit, chairman of the program committee, introduced the speaker. The chairman appointed W. Lee Roueche, Dick Deas, E. A. Thomas, W. O. McMahon and L. N. Shannon on a nominating committee to present a slate of officers at the closing meeting in May for the coming year.—*H. B. McLaurine.*

E. Canada-Newfoundland

MOTION pictures comprised the program of the March 17 meeting of the Eastern Canada-Newfoundland Chapter of the A.F.A. Attendance totaled 144 members and guests. The United States Steel Corp.'s picture, "Steel—Man's Servant", was the highlight of the evening and was supplemented by several war production and combat record films supplied by courtesy of the National Film Board.

Gratifying response was reported on arrangements under way for the two-day foundry conference to be held at New Glasgow, Nova Scotia, May 11-12.

A nominating committee under the chairmanship of C. C. Brisbois proposed a slate of officers and directors for the 1944-45 season. These and any further nominations will be voted upon at the next general meeting, which will be the annual and closing meeting for the season.—*A. E. Cartwright.*

Rochester

SIXTY-FIVE members and guests attended the April meeting of the Rochester Chapter of the A.F.A. which was held at the University of Rochester, Rochester, N. Y., on April 5. Howard F. Taylor, associate metallurgist, U. S. Naval Research Laboratory, Washington, discussed "The Future of Steel Castings", and stressed the need for extensive study of foundry methods as a means of guaranteeing the future success of the industry. He pointed out benefits to be gained from a thorough study of gating principles and improved methods of casting examination.

X-ray and magnetic powder testing have provided a means of checking the soundness of castings produced with various foundry techniques, and the use of the atmospheric pressure principle in risers has assisted in producing inherently sound castings with a minimum weight of riser metal. Recent developments for the removal of risers and pads by means of the cutting torch have helped to lower cleaning costs, and to permit more efficient riser design. There is a need for vastly improved refractories and foundry sands in the steel foundry industry, and the use of efficient deoxidizers should have careful study. Mr. Taylor's interesting talk was followed by a half-hour discussion on a number of pertinent points.

Next meeting of the chapter will be held on May 3, when Harry W. Dietert, Harry W. Dietert Co., Detroit, will speak on "The Behavior of Sands and Cores at Elevated Temperatures". — *Donald E. Webster, secretary-treasurer.*

Quad-City

QUAD City Chapter of the A.F.A. met at Hotel Fort Armstrong, Rock Island, Ill., on March 20, with 68 members and guests in attendance. Subject for the evening was "Metallurgy of Nonferrous Metals in the Casting Foundry," presented by C. O. Thieme, vice president in charge of production, H. Kramer & Co., Chicago.

Preceding the technical portion of the meeting, a moving picture entitled "Women in the Aluminum Foundry" was shown. This picture gave an interesting review of foundry operations at the Caterpillar Tractor Co., Peoria, Ill., for production of aluminum cylinder heads.

In the technical discussion, Mr. Thieme covered the nonferrous fields from the viewpoint of the metallurgist and foundryman. He discussed the problems of present day metallurgists, and mentioned that the casting of bells represents the greatest art developed in brass founding. Mr. Thieme complimented the American Foundrymen's Association on the excellent work done by the committees on designs and casting defects. The speaker dwelled at length on the problem of gases in nonferrous castings, and discussed various types of melting units, oxidizing and fluxing of metal. Mr. Thieme concluded his talk with a brief review of the physical properties of commonly used metals. An interesting discussion period followed.

W. E. Jones, Ordnance Steel Foundry, chairman of the meeting, announced a nominating committee for selection of officers for 1944-45. The committee will consist of Alex Matheson, French & Hecht, Davenport, Iowa, chairman; Clyde Burgston, Deere & Co., Moline, Ill., and R. H. Swartz, Ordnance Steel Foundry, Bettendorf, Iowa.—*H. L. Creps, secretary-treasurer.*

Northeastern Ohio

FIRST sectional meeting of the Northeastern Ohio Chapter of the A.F.A. hit a new high in attendance with 235 members and guests at dinner, and over 275 at the technical sessions which followed. The meeting was held at the Cleveland Club on April 13, and President James G. Goldie presided. He read the report of the nominating committee which submitted the following list of members for officers and directors for the coming year:

For president, Russell F. Lincoln, Russell F. Lincoln Co.; vice president, William G. Goebert, Bowler Foundry Co.; treasurer, F. Ray Fleig, Smith Facing & Supply Co., and secretary, Gilbert Nock, Nock Fire Brick Co. Directors for a 3-year term include Gordon B. Carson, Case School of Applied Science; Frank Weisehan, Ferro Machine & Foundry Co.; J. E. Dvorka, Eberhard Mfg. Co. Division, Eastern Malleable Iron Co.; Elmer Zirzow, National Malleable & Steel Casting Co., and Bert S. Parker Jr., Youngstown Foundry & Machine Co., Youngstown, O.

Following the dinner those attending broke up into smaller groups for discussion of problems and postwar trends in foundry practice relating to gray iron, steel, malleable cast iron, magnesium and aluminum, and patternmaking. About 100 were present at the meeting devoted to magnesium and aluminum which was under the direction of Robert T. Wood, American Magnesium Corp. Edward Vargo, Wellman Bronze & Aluminum Co., was the discussion leader, and covered a wide range of topics including molding and core sand, molding methods, gating and risering procedures, and salvaging of castings by impregnation and welding. Keen interest was displayed in Mr. Vargo's remarks and following his brief outline of the various phases, a very lively discussion ensued in which the chairman and members from the floor as well as Mr. Vargo answered numerous questions.

The patternmaking group consisting of about 30 under Chairman John S. Parker, Motor Pattern Co. and, with George Gedeon, Aluminum Co. of America, as discussion leader gave close consideration to such features as education of pattern buyers to the importance of proper pattern equipment, pattern coatings, draft and finish allowance of patterns, education of engineers and designers, and co-operation between patternmaker and foundryman. It was pointed out that there is an increasing tendency of engineers and designers to reduce draft and finish allowance which causes difficulty in obtaining suitable castings from pattern withdrawing and other trouble.

At the gray iron session presided over by Ralph Wieland, Forest City Foundry Co., the future of the gray iron industry and related features were discussed by A. C. Denison, Fulton Foundry & Machine Co. He pointed out that gray iron has valuable engineering properties, but that up until recently this feature has not been stressed sufficiently. Publicity is needed to educate potential buyers of castings. Fundamental features in the successful operation of a foundry include the manufacture of a product for which there is a demand, knowledge on the part of the foundry to produce castings to meet customers' demands, and engineering minded sales force able and willing to show customers the advantageous properties of gray iron.

Tom West, vice president, West Steel Castings Co., Cleveland, was discussion leader of the steel group, with Bruce Aiken, Crucible Steel Casting Co., Cleveland, chairman. Mr. West outlined gen-

(*Continued on page* 122)

. . . to Move OUNCES or TONS!

Two views of Logan installations in a Midwestern foundry. Castings are inspected at convergence of two conveyor lines; these approved move up through inclined conveyor (in background) to scale, passing over gravity section mounted on scale platform. After weighing, castings may be diverted to either of two assembly lines by means of Logan Alligator Switch, seen at right in top photo.

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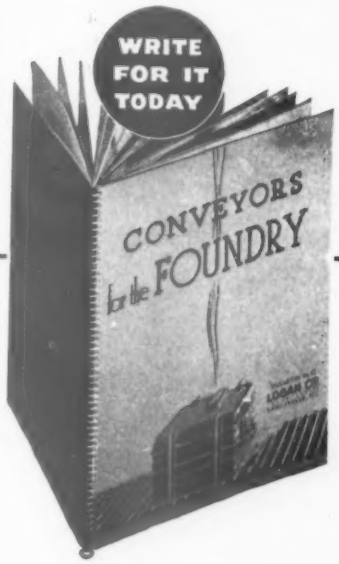

PUT FLOW INTO PRODUCTION WITH Logan Conveyors

(*Continued from page* 120)

eral practice and latest developments relating to the following phases of steel foundry operations: Coatings for cores and molds; patent risers in steel practice; melting and pouring trends, and radiograph in inspection. General discussion followed presentation of each topic.

One of the liveliest discussions of current and future practices was held by the malleable group under Chairman J. J. Witenhafer, Lake City Malleable Iron Co., with John Urban, Fanner Mfg. Co., as discussion leader. Approximately 50 were present and listened to Mr. Urban outline various problems connected with malleable iron production. In the general discussion which followed use of boron, fuel oil in sand to reduce drying-out, and numerous other features were covered.

Pittsburgh

THE whole subject of bond clays was given a thorough going-over in the March meeting of the Pittsburgh Foundrymens Association. N. J. Dunbeck, Eastern Clay Products Co., Eifort, O., outlined the various classes of bond clays, what their properties are, and what function each performs in the sand system.

In a comprehensive coverage of the subject, the speaker discussed the origin of each type of clay, including the fire clays, illite, and northern and southern bentonite. Pointing out that the refractory qualities of each vary, and the amount of permeability each imparts to a mold also varies, as well as the methods used in handling each type, Mr. Dunbeck described the methods which should be used in selecting the proper clay or mixture of clays to suit each particular job.

M. J. Kellner, Walworth Co., Greensburg, Pa., led an active discussion of the subject following the talk. The nominating committee which is to select nominees for 1944-45 officers also was named at this meeting. It is composed of H. N. Wilson, Taylor-Wilson Mfg. Co.; W. H. Satterfield, Pittsburgh Steel Foundry Co.; and Hugo Hautman, Westinghouse Air Brake Co. The committee will report at the April meeting, and election will be held at the May meeting.—*R. L. Hartford.*

Western Michigan

MARCH 13 meeting of the Western Michigan Chapter of the A.F.A. was held at the Hotel Ferry, Grand Haven, Mich., with 106 members and guests in attendance. Dr. Ralph L. Lee, General Motors Corp., Detroit, was the speaker of the evening.

Dr. Lee's talk was "Facing Facts in Employee Relations." He said that our greatest problem is to be able to analyze, classify and learn how to deal with men as individuals. He gave the following several facts which, when properly taken into consideration, would improve greatly the relationship of the supervisor to men under him:

1. Everyone is different, and the only one of his kind. Therefore, everyone requires different treatment.

2. Most people are what they are because they can't change or be changed much. Some supervisors try to make all people over to what they want, but every person has different capabilities.

3. No one individual is the same all the time. A supervisor should take into consideration an employe's temperament at the time he approaches him. An employe who has suffered bad luck of some kind will not be in the same frame of mind as when he is free of worry.

4. Everyone is proud of being different. The individual must have personal recognition from the supervisor.

Dr. Lee raised these questions: Have we in our efforts to get out production and increase efficiency taken personal relations so much for granted as a natural by-product of working together that we have left them to shift for themselves? Is it possible that, without noticing or intending it, the work in our modern shops has become so thoroughly systematized, specialized and mistake-proofed that it no longer requires sufficient contact between the individual and his boss to enable them to develop the close personal relationship our facts tell us is the only cure for group relations difficulties?

Fred Walls, International Nickel Co., gave a short coffee talk on, "Trends in the Foundry Industry."—*C. H. Cousineau, secretary.*

Philadelphia

MARCH 10 meeting of the Philadelphia Chapter of the A.F.A. featured a talk by Howard F. Taylor, Naval Research Laboratory, on the subject "The Future of Steel Castings." Mr. Taylor discussed the market, the manufacture and the selling of the steel foundry product. He envisioned a growing market for an improving product, education of the purchaser through more fundamental but entertaining sales appeal, and greater specialization among foundries, each excelling in some molding and casting technique. He pointed out the need for greater fundamental knowledge secured by more generous application of research, and the desirability of obtaining foundrymen with better technical background. Young engineers must have a real stake in the foundry of the future.

Mr. Taylor emphasized an often forgotten truth: "The industry will be what the will of the industry makes it." New markets, new tools, new fundamental data and new brains will be lumped together to produce improved steel castings having the desired properties of greater quality at lower installation cost.

Mr. Taylor was introduced by Technical Chairman Clyde Jenni, General Steel Castings Corp. Chairman Bartells officiated, and accepted with regret the resignation of William Thomas, a chapter director, who has left the North Bros. Mfg. Co. to take a new post within the jurisdiction of another chapter. The chairman appointed a nominating committee headed by J. M. Robb, to offer nominations for the coming year.

The Army furnished two restricted war pictures as substitutes for the conventional coffee talks. These pictures were of sobering influence.

Reading

REGULAR monthly meeting of the Reading Foundrymen's Association was held at the Berkshire Hotel, Reading, Pa., on March 21, with H. P. Good, president of the association, presiding. B. A. Miller, chief metallurgist, Cramp Brass & Iron Foundry Division, Baldwin Locomotive Works, was the principal speaker, his subject being "Cast Copper-Base Alloys."

Rigid temperature control of metals in tin-bronze, copper silicon bronze alloys and manganese bronzes was advocated by Mr. Miller. He stated further that to obtain the high tensile strengths that are being achieved today, metal should never be heated more than 100 degrees above pouring temperatures, and urged a study of castings to determine the type of gate to be used.

Showing pictures of a number of types of castings made by Cramp, special emphasis was placed upon propellers made for the Navy. These weigh from 35,000 to 50,000 pounds each. To give some idea of the improvements made in alloy castings, Mr. Miller said that tensile strengths have been increased from 50,000 pounds per square inch to more than 120,000 pounds, in manganese bronzes.

Proper sand conditions are of prime importance, Mr. Miller pointed out, and the use of good clean scrap is essential. An analysis of purchased ingots also was advocated to control gases in metals, particularly hydrogen.

About 60 members and guests were present at the meeting.—*H. C. Cummings, secretary.*

Northern California

REGULAR monthly meeting of the Northern California Chapter of the A.F.A., held at the Engineers Club, San Francisco, March 10, had as its guest speaker E. Dale Trout, General Electric X-Ray Corp. Harry A. Bossi, chapter president, presided at the gathering of more than 100 members and guests.

Prior to the meeting, directors elected H. McCaughey, Vulcan Foundry Co., Oakland, a director to fill the unexpired term of A. R. Linn, whose membership in the association had been terminated. No successor was named to the directorship held by Fred L. DeSanno, DeSanno Foundry & Machine Co., Oakland, who died Feb. 17. Mr. DeSanno's term would have expired June 30.

(*Concluded on page* 125)

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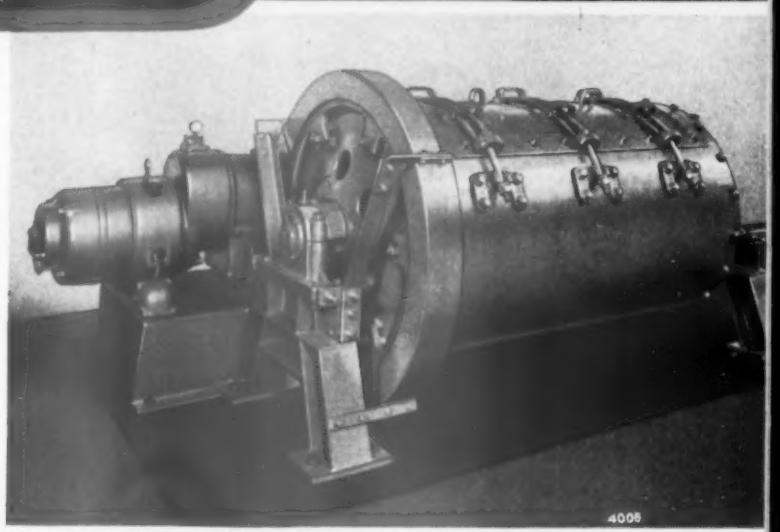

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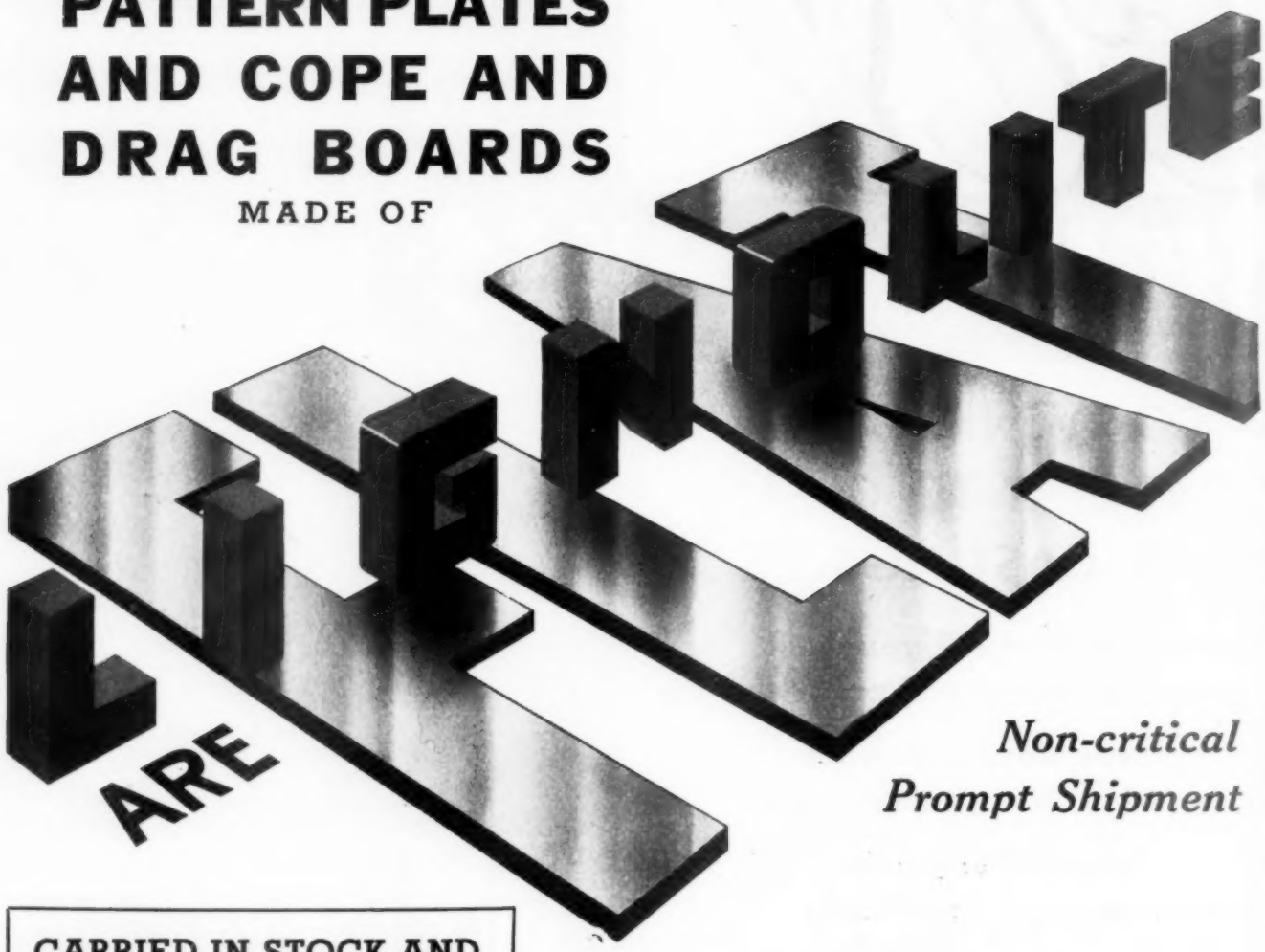

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(*Concluded from page* 122)

Mr. Bossi took occasion to welcome Charles J. P. Hoehn, Enterprise Engine & Foundry Co., a past president of the chapter, also John D. Fenstermacher, Columbia Steel Co., and new members and visitors. Mr. Bossi mentioned activities of the sand committee and the regular attendance at its bimonthly meetings, which are being held at different foundries after a preliminary inspection of their sand equipment.

Dr. C. D. D'Amico introduced Mr. Trout, who gave an illustrated and highly interesting talk on "Industrial Application of the X-Ray."—*George L. Kennard, secretary.*

Chicago

MUSEUM of Science and Industry was host to the Chicago Chapter of the A.F.A. for its regular meeting on April 4, serving an excellent dinner and conducting tours of groups through specially-selected exhibits. This was the second consecutive year that the April meeting has been held at the Museum. Attendance was approximately 280 members and guests.

To afford maximum time for inspection of exhibits, the business portion of the meeting immediately after dinner was held down to essentialities. Chapter Chairman M. F. Becker, vice president, Whiting Corp., Harvey, Ill., presided. Arthur S. Klopf, vice president and manager, foundry division, Hansell-Elcock Co., chapter vice chairman and chairman of the program committee, introduced Maj. Lenox R. Lohr, president of the Museum, who welcomed the visitors and thanked the chapter for its sustained interest in the operating foundry exhibit.

Secretary Frank E. Wartgow, manager, employe's suggestion system, American Steel Foundries, read the report of the nominating committee. This proposed the following officers for 1944-45: Chairman, Mr. Klopf; vice chairman, J. C. Gore, Chicago manager, Werner G. Smith Co.; secretary, Mr. Wartgow. Nominees for directors are: Retiring Chairman Becker; Laurence H. Hahn, metallurgist, Sivyer Steel Casting Co.; W. D. McMillan, works metallurgist, McCormick Works, International Harvester Co.; and Harry M. St. John, superintendent brass foundry, Crane Co. Election and installation of officers will take place at the May meeting.

Highlight of the museum tours was the operating foundry exhibit which was installed and opened to the public in 1939 under sponsorship of the Chicago Chapter. Equipment and supplies used were made available by a large number of companies, which have maintained their interest in the project. Two years ago, the chapter raised additional funds to install a public address system and better accommodations for spectators.

The demonstration is now about as effective as it can be made. Because of manpower shortage, the operation is being carried on by students of Washburne Trade School. A portion of the castings being made are of commercial type and are going into war use.

Among other exhibits visited were those recently installed to depict a world at war. The museum has done an excellent job in bringing in new items and rearranging old to emphasize the part industry is playing in winning the war. Outstanding is a section devoted to captured German ordnance, airplanes, and other equipment, as well as relics from the bombings of England. A portion of this is sponsored by the British government, and is explained by flyers who have participated in bomb raids on Berlin.—*Erle F. Ross.*

St. Louis

LARGEST attendance of any regular meeting of the St. Louis Chapter of the A.F.A. was on hand March 9 when 205 members and guests gathered at the De Soto Hotel.

As a surprise feature A. H. Sullivan, production service specialist, War Production Board, St. Louis, arranged for two "coffee talkers" to explain the object of the proposed foundry training school to be established in St. Louis. The speakers were Mark Brooks, area training supervisor, War Manpower Commission, and L. H. Dally, assistant manager, St. Louis Division, United States Employment Service. These talks created such interest that it was decided to attempt to arrange a meeting devoted to this subject.

Speaker of the evening, M. J. Gregory, factory manager, Caterpillar Tractor Co., Peoria, Ill., assisted by Zigmond Madacey of the same company, had as his subject, "Core Blowing". The talk, illustrated with slides, was well received and created a discussion period of more than usual interest and length. After the discussion, a sound movie showing the Caterpillar Tractor Co. cylinder head aluminum foundry in operation was shown.—*J. H. Williamson, secretary-treasurer.*

Wisconsin

NOMINATIONS for officers of the Wisconsin Chapter of the A.F.A. were presented at the group's regular meeting March 10 as follows: President, Harry E. Ladwig, Allis-Chalmers Mfg. Co.; vice president, John Bing, A. P. Green Firebrick Co.; secretary, David C. Zuege; treasurer, Richard F. Jordan, Sterling Wheelbarrow Co.

Nominated for directors were: George K. Dreher, Ampco Metal Inc.; Arthur C. Haack, Wisconsin Gray Iron Foundry Co.; Paul F. Rice, Milwaukee Chaplet & Mfg. Co.; Alfred M. Fischer, Charles Jurack Co.

Speaker of the evening was Dr. James Shelby Thomas, formerly head of Chrysler Engineering Institute, who spoke on "New Frontiers for the Smart Foundryman." Dr. Thomas presented a sweeping outline of the industrial changes and improvements resulting from the war, and pointed out the opportunities for the future.—*Darold W. Thiem, publicity chairman.*

Ontario

A SUCCESSFUL group meeting featuring gray iron, nonferrous and malleable divisions was held by the Ontario Chapter of the A.F.A., at the Royal York Hotel, Toronto, Feb. 25. Prior to the group discussions, the slate of nominations for 1944-45 was presented. A number of new members were welcomed into the chapter and J. H. King, chairman of the membership committee, reported that Ontario Chapter stood third in number of company members amongst the 25 chapters.

Speaking before the gray iron group, which was under the chairmanship of A. Bock, Sheldon's Ltd., H. Fairfield, Bureau of Mines, Ottawa, gave a brief description of the new metallurgical laboratories of the bureau. He indicated something of the achievements of metallurgical research during the war, and reviewed future possibilities of research in the foundry industry.

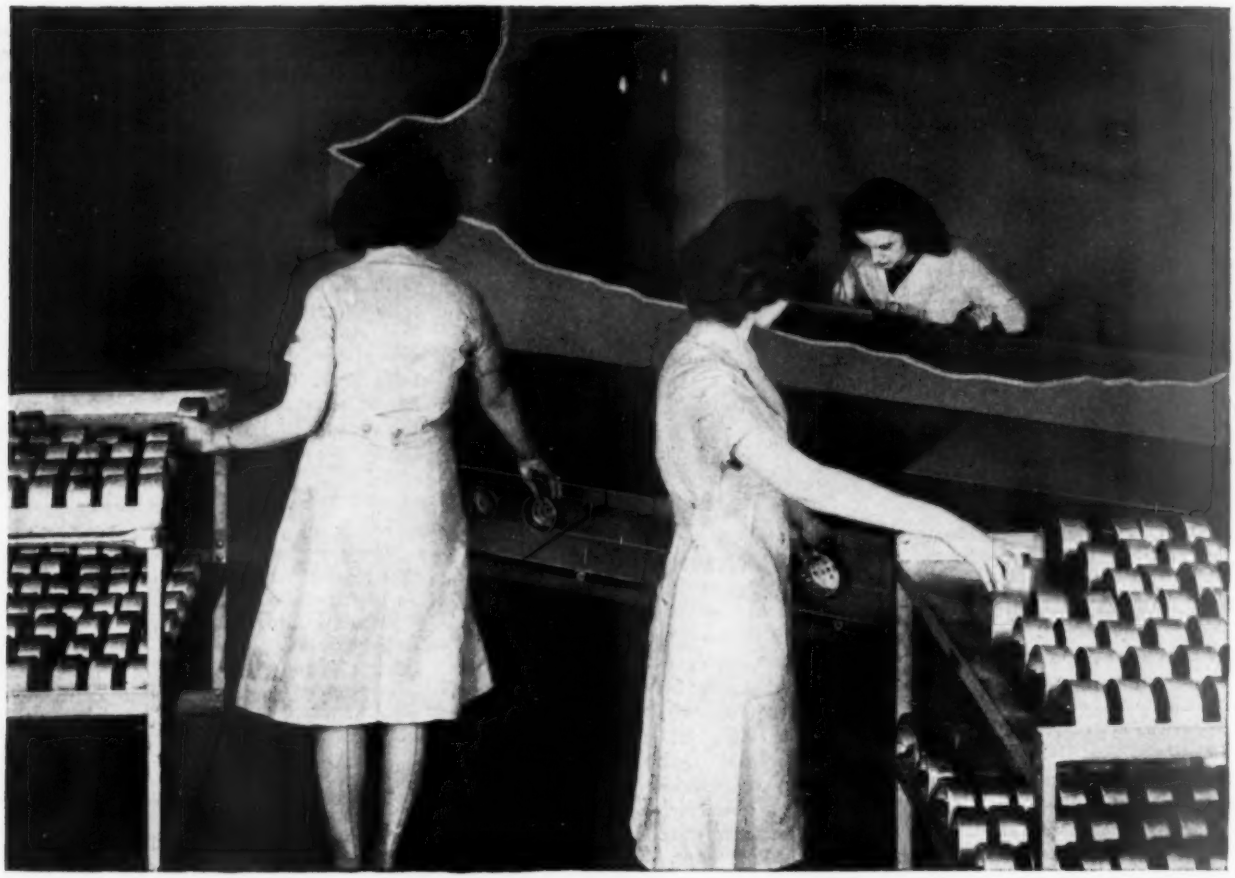
In the nonferrous group, under the chairmanship of J. Dalby, Canada Metal Co. Ltd., E. G. Jennings, Ottawa, discussed wartime nonferrous metals. He dealt particularly with tin bearing alloys and the manganese silicon and aluminum bronzes. The characteristics of A, B, C, D, and E tin-containing alloys were discussed and important suggestions were made as to best foundry practice in these grades. Outlines also were given of the principal grades and types of manganese bronze, silicon bronze, and aluminum bronze, and the speaker discussed briefly foundry practice and the characteristics to be achieved in each.

In the malleable group, under the leadership of J. Cunningham, International Malleable Iron Co. Ltd., H. Bornstein, Deere & Co., Moline, Ill., spoke on "Malleable and Pearlitic Malleable Castings." This talk by Mr. Bornstein covered malleable practice in considerable detail.—*G. L. White, secretary-treasurer.*

Cincinnati

L. P. ROBINSON, the Werner G. Smith Co., Cleveland, addressed the March 20 meeting of the Cincinnati Chapter of the A.F.A. at the Cincinnati Club. Edward H. King, chapter chairman, presided at the meeting which was attended by about 80 members and guests.

Mr. Robinson's talk on "Variables which Enter into the Baking of the Core," had been anticipated with pleasure for months. The speaker's years of experience in coreroom practice and his inimitable manner made for one of the chapter's most profitable and enjoyable meetings.—*Martin F. Milligan, secretary.*



Unusually compact, installation of G-E Model AX-160 Unit requires but little space. Operator (left) loads castings on conveyor tray; operator (center) unloads parts after they have been inspected by operator (right) who is stationed in light-proof booth which also houses the x-ray unit control panel.

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MODERN DESIGN MARKS NEW STEEL FOUNDRY

(*Continued from Page* 67)

New silica sand brought to the plant in drop bottom gondolas and discharged into a chute between the rails of a spur track outside the east end of the building, falls into a basement chamber where it is maintained in a dry and workable condition. The upper end of the chute is closed by steel doors to prevent the entrance of snow or rain in periods between sand reception. In the basement a portable sand throwing device is employed to shift the sand from under the chute and pile it up in the vicinity of the side walls. In routine daily operation the same device is employed to transfer the sand from the piles to a conveyor which feeds a bucket elevator, which in turn discharges the sand into a large storage tank or hopper erected above the foundry floor. Sand conforms to the following screen analysis: 23.5 per cent on No. 40, 28.7 per cent on screen 50, 19 per cent on No. 60, 3.2 per cent on No. 70, 8.6 per cent on No. 80, 6 per cent on No. 100, 2.4 per cent on No. 140.

Prepare Green Sand Facing

Measured batches of sand fall by gravity into a muller type mixer where other necessary ingredients are added to produce a satisfactory green sand facing. Each batch contains 800 pounds new silica sand, 32 pounds bentonite and 12 pounds of a proprietary cereal binder. Moisture content is held to approximately 3 per cent. The prepared sand is discharged from the mixer into tote boxes and transported by crane or truck to the various molding stations. Here it is stored in suitable hoppers resting on the floor. Through an opening in the side wall of the hopper near the bottom, the molder shovels enough facing sand to cover his pattern.

All the black, or backing sand used in the day's operation is prepared in a somewhat similar manner. Molds are shaken out at a central station shown in Fig. 1, and empty flasks are returned to the various molding stations. The castings are taken to the heat treating department, and the sand falls through a grating into a large underground hopper from which it is removed by an inclined conveyor and discharged over a magnetized pulley into a revolving screen. The combination removes all metallic scrap, core butts and other foreign material. A long inclined belt carries the sand to a point where it falls into a companion hopper in which the new sand is stored for facing. From here the process is almost similar to that employed in preparing the facing sand. The main points of difference lie in the mixture and the method of distribution. Of course the amounts of binder material vary to some extent from time to time in accordance with reports furnished by the sand testing laboratory. An approximate mixture for the backing sand contains 800 pounds old sand, 2 pounds bentonite and 1 pound cereal binder. The moisture content is held to approximately 3 per cent. The prepared sand is distributed by belt conveyor to hoppers located over the various molding machines.

Core sand mixtures are made up according to three formulas depending to a considerable extent on the shape and size of the cores and the position they occupy in the mold. No. 1 mixture contains 260 quarts silica sand, 3 quarts oil and 9 quarts cereal binder. No. 2 contains 260 quarts sand, 3 quarts oil and 10 quarts cereal binder. The third mixture for cores subjected to severe service is made up of 260 quarts sand, 5 quarts oil and 6 quarts cereal binder.

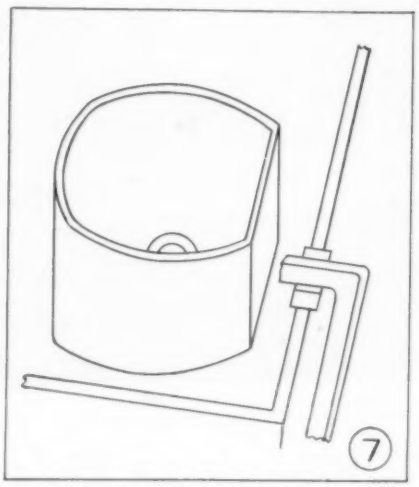

Fig. 7—A flat side on the runner cup leaves room for the toe of the clamp

Molds from the various stations are lifted by one of the cranes and set down in straight rows on the floor in the general vicinity of the electric melting furnace. Part of this floor with molds in place is shown in Fig. 2. Pouring is facilitated to a considerable extent by making all molds in flasks limited to a few standard sizes. With this arrangement they can be set up in groups of the same height and with the runner cups in straight lines. The crane man can move the ladle rapidly from one flask to another, a factor of considerable importance in pouring the contents of a large ladle of steel into a great number of small molds. Metal in the ladle is hot, but unfortunately it will not stay hot forever.

Incidentally, it would appear to be logical that when and if medals ever are distributed among foundry employes, a special shiny model with laurel and oak leaves will be presented to the men who operate foundry cranes with such a nice blending of skill, grace and accuracy. Spotting the hidden nozzle of a ladle over the center of an unseen pouring cup may not be as spectacular and difficult as driving the well known camel through the eye of a needle, but certainly it is one job that cannot be learned through correspondence.

In many flasks the bars are not attached permanently. A projection on the top at each end rests on the cope wall. With this design the bars may be shifted or changed to suit several patterns in succession. Gravity holds the bars in position while the cope is being rammed full of sand. Later when the finished cope is closed down on the drag, a steel bar or a long clamp is laid on the projections and is wedged under the regular flask clamps in the usual manner. In some instances where the sprue is close to the side of the cope, and for that reason the space is limited, a flat place is provided on one side of the dry sand pouring cup as shown in Figs. 2 and 3.

After each heat is poured, the molds are picked up by the crane, singly or in groups depending on the size, and shaken out on a large jolting device under an exhaust hood which removes steam and dust. This elaborate exhaust system with intakes wherever dust, sparks or steam are created maintains a clear atmosphere in the foundry. Mechanism in the vicinity of the shakeout station may be adjusted to remove a definite quantity of fines from each batch passing through. The proper amount is determined by information from the sand laboratory where samples are tested at hourly intervals.

Metal Melted in Basic Furnace

Metal for the castings is melted in a basic lined electric furnace situated near the east end of the main bay and therefore close to the stock yard on the outside where the raw materials are piled close to the railroad track. The furnace is rated at 2 tons capacity per hour. The usual charge is 8000 pounds. As cast the metal is hard and brittle. Extensive heat treatment is required to bring the castings to maximum potential quality of strength, toughness and wearability. Practically all castings made in this section of the plant are auxiliary parts of military tanks.

The division under discussion at the moment is equipped with a battery of four oil fired, car type heat treating furnaces, located at one side near the west end of the foundry. The general appearance of the main exterior features is shown in Fig. 3. The quenching tanks situated opposite the furnaces and a little over a car length distant are not shown. Castings with gates and risers attached as shown in the foreground are loaded on carriers in the vicinity and thus are in position to be placed promptly on the furnace cars when the treated loads are removed. Gates and risers are not removed until the castings have passed through the first furnace where they are stress relieved at a temperature of 1300 degrees Fahr. The risers are cut off with a gas torch while the castings are still hot.

Castings receive a general inspection after they are shaken out, and any found with obvious defects are returned to the furnace for remelting. The main rigid inspection takes place after the castings

(*Concluded on Page* 130)

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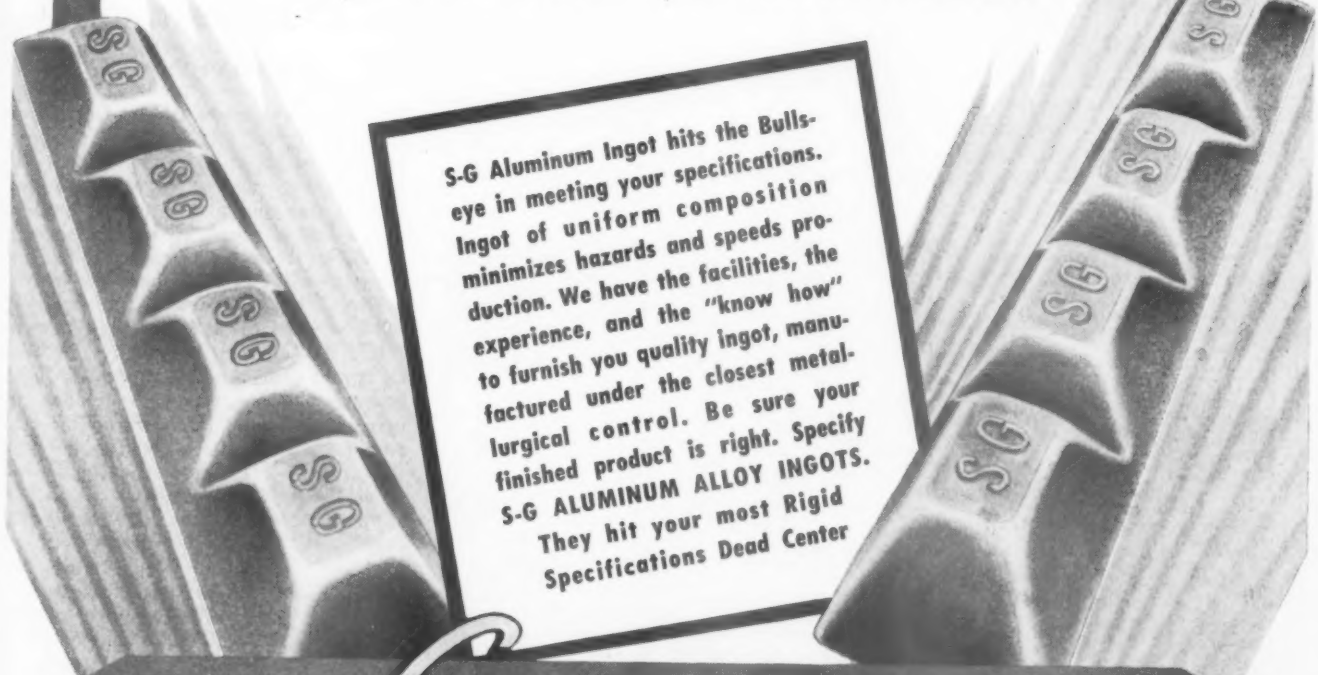

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(*Concluded from page* 128)

are removed from the homogenizing furnace. They are air cooled and pressure blasted and then inspected minutely for surface or other flaws and imperfections. Castings that pass inspection are reheated, then quenched and placed in a hot draw furnace. Later they are quenched again and pressure blasted.

Minor surface defects that do not affect the utility of the casting are repaired by welding. The castings are heated over an open fire to a temperature ranging from 300 to 900 degrees, depending on the character and position of the weld. Castings treated in this manner are drawn again. The home-made emergency preheating furnace is shown in Fig. 4. Castings are piled loosely on a grating over the fire, raised to the required temperature and then pushed over the end.

The battery of swing grinders shown in Fig. 5, and under which the castings receive the final finishing touches, is connected to an exhaust system which effectually draws sparks, dust and metal particles away from the operators and thus eliminates practically all the potential hazard usually associated with this branch of foundry operation. The men wear goggles, aprons, safety shoes and leggings.

Promoting Safety by Job Instruction

(*Concluded from page* 68)

visor is getting job instruction started and then kept in use. He must regard his job as a vital part of production and not exclusively as a safety program. Instead of harping on safety with little if any emphasis on production, he should harp on production, with appropriate emphasis on safety, quality, cost and all the other necessary features. The safety man should introduce a program of job instruction, that hammers forever on the theme that there is one right way to do every job and that way is the production way, the quality way and the safe way.

Salvaging Castings By Welding

(*Concluded from page* 116)

plate placed on the welding table provided good contact and also prevented the flow of deposited metal beyond the lower machined surface of the casting. The simple set-up is shown in Fig. 1.

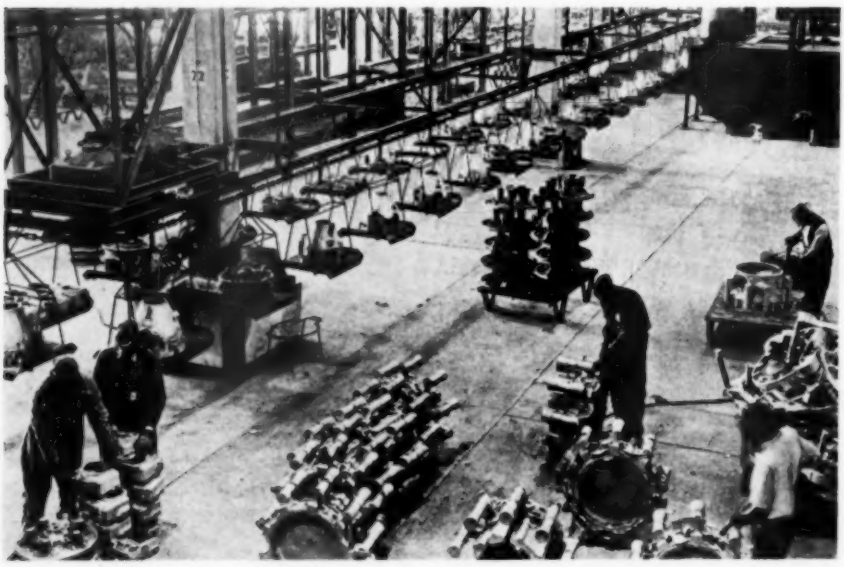
Only a very small deposit was needed to bring the lug up to the required size. In making the deposit, care was taken to prevent it from extending beyond the machined surface on the inside of the piece. The purpose of this precaution was to avoid having to perform a second machining operation on this surface.

Although it is possible to deposit a mild steel electrode on gray cast iron with the electric arc using any of the coated mild steel wires that commonly are supplied for this purpose, the high temperature necessary for complete fusion may result in the formation of a zone of hard chilled cast iron, plus an admixture of the deposited steel and the parent metal. The pronounced hardness of such a zone makes it definitely not machinable and usually cross checking is quite prevalent.

The special nonferrous rod used is a fabricated electrode, having an inner core of pure nickel and an outer sheath of pure copper, which is gripped by the electrode holder. Since the melting point of copper is approximately 260 degrees Fahr. below the melting point of cast iron, the process may be assumed to be a combination of fusion and brazing, with very slight penetration. The melting point of an alloy having the equivalent compositions would be considerably higher than that of the cast iron.

Characteristics of the deposit made by the fabricated electrode are important to the success of the operation. The deposit is an alloy which contains no iron or other carbide forming elements and therefore, develops no undue hardness at the line of fusion, so that the weld and the weld zone are fully machinable. Another characteristic which is usually desirable in the welding of iron castings during production is that the deposit is of the same color as cast iron.

Fig. 3 shows a view of the casting after the deposit was applied. None of the machined surface has been disturbed, and the small amount of heat applied to the piece was not sufficient to cause any distortion. After being allowed to cool in still air to room temperature these castings, shown in Fig. 4, were returned to the machine shop where a hole was drilled and tapped through the weld metal. Although the line of fusion practically bisected the area of the hole, no difficulty was experienced in these operations. The over-all cost of salvaging these castings for use in production was estimated to be not in excess of 15 cents per piece.



WORLD'S LARGEST: View of a small part of the cleaning department at the Dodge Chicago Plant's magnesium foundry. This Chrysler Corp. division, building 18-cylinder Wright 2200 horsepower aircraft engines, operates the largest of all magnesium foundries. Not yet at all full capacity, the foundry at present is melting about 50,000 pounds of magnesium daily

Bearing Maker Has Anniversary

Cleveland Graphite Bronze Co., Cleveland, celebrated its twenty-fifth anniversary on March 22. The firm with "20 employes and no working capital" entered the automobile parts business with a line of graphited bronze bushings in 1919. Four men who founded the company—Ben F. Hopkins, J. J. McIntyre, James L. Myers, and Carl W. Johnson—are still its executive managers. While the automotive industry has been its largest peacetime customer, the firm's bearings also are used by railroads, various types of engines, farm equipment and machinery. With the beginning of the armament program Cleveland Graphite Bronze Co. was given the assignment of pioneering the large scale production of lined bearings for aircraft engines. Developing its own processes, the company since Pearl Harbor has turned out more than $50,000,000 of those parts which are made to extremely close tolerances and subjected to x-ray inspection.

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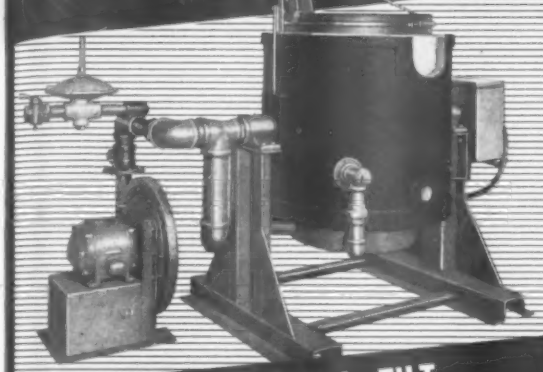

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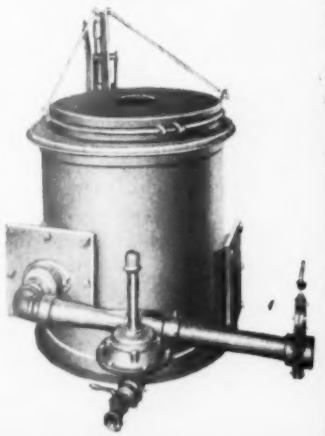

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WATER QUENCHING OF STEEL CASTINGS

(*Continued from page* 59)

However, during the same year Specification A 154-33T, Carbon Steel Castings for Industrial, Railroad and Marine Uses, was issued, which included a clause to the effect that quenching of castings was not permitted except by agreement between buyer and producer.

By 1939, however, practically all of the A.S.T.M. steel casting specifications carried clauses giving requirements necessary for liquid quenching. A note was included in these specifications to the effect that "Accelerated cooling by liquid contact develops properties that are advantageous for certain purposes, when the details of steel casting design, of chemical composition, and of shop practice are suitable for liquid quenching."

It will be noted from the above clause that the producers of steel castings had many reservations regarding the shape, size and composition of castings that could be successfully quenched on a commercial production basis. If castings weighed much more than 100 pounds and were not of fairly uniform sections, they were not considered as adaptable to the quenching heat treatment.

Opposed to Water Quenching

The Army and Navy Specifications have been opposed to the water-quenching of steel castings. As late as November, 1941, when Federal Specification QQ-S-681b was adopted, all steel castings were required to be furnished in the full annealed condition. The rapid cooling of castings was not permitted without specific authority from the purchaser. The 1941 revision permitted four classes to be given the quench and tempering treatment.

The Navy Specification 49S1, as in effect today, does not permit the liquid-quenching of steel castings without special approval of the Navy bureau concerned in the purchase of the castings.

Thus, it may be seen that specification requirements and the lack of interest on the part of both buyer and producer, in the liquid-quenching practice resulted in but a low tonnage of steel castings produced with a quench and temper heat treatment.

The 1940 production of steel castings was about 900,000 net tons. It has been estimated that of this amount 270,000 tons consisted of low alloy steel castings; and of this amount, perhaps 50 per cent of the alloy steel was produced by the electric furnace practice, even though records show that of the over-all casting production, the open hearth production during 1940 accounted for approximately 65 per cent. Practically all of the alloy steel produced by the open hearth shops was given a normalizing heat treatment.

The normalizing heat treatment was, of course, the predominating heat treatment given alloy steels, and the writer assumes that at least 90 per cent of the 135,000 tons of electric furnace alloy steel was given this treatment.

It is thus believed that the commercial quenched and tempered casting production of 1940 did not exceed 5000 tons (excluding experimental army castings), less than 5 per cent of the electric alloy steel production—or less than one-half of 1 per cent of the entire casting production.

Compare the 1940 figure with what is considered as a fair figure of production of castings receiving the quench and temper treatment for 1943. It is believed that not less than 250,000 tons of steel castings received a quench and temper treatment, or at least 8 per cent of the entire casting production, which was estimated to be about 3,000,000 net tons.

The most popular quenching medium is water. Of 31 foundries that quenched castings in 1938, 19 foundries reported to the American Foundrymen's Association that water-quenching predominated. Nine foundries indicated that oil-quenching was used in most cases, and 3 indicated that oil and water were used about equally.

Water Quenching Predominates

At the present time, water-quenching not only predominates as the quenching fluid for steel castings, but it is used almost exclusively by the foundries.

Prior to 1940, buyers generally had but little experience with quenched and tempered steel castings. In fact, many design engineers and buyers had the impression that it was impossible to obtain high tensile and yield point property values of wrought steels by using cast steels. Furthermore, they also believed that steel castings were brittle if given the quench and tempering treatment. Of course, both beliefs are far from the truth. Cast steels and wrought steels of similar chemical compositions develop comparable properties after quenching and tempering operations.

The fault for these erroneous beliefs on the part of the buyer lies somewhat with the steel casting producer, for he has not popularized information regarding the water-quenching of steel castings. Realization of this condition has led the Steel Founders' Society to publish information widely on the properties of quenched and tempered cast steels such as shown in Fig. 1 to 5.

Of primary interest to users of castings is the fact that their knowledge of the possibilities of quenched and tempered castings was gained through the actual experience of working with these castings.

The Army learned, during the lend-lease period which just preceded our entrance into the war, that they had considerable need for high tensile-high yield point steel castings. Castings designed for these strengths required water-quenching treatment. Also, it was found that water-quenching treatment was advisable for the obtaining of excellent ballistic properties for steel castings. Thus, War Department prime contractors and sub-contractors began to see, work with and study the properties of quenched and tempered steel castings which they would not have experienced under normal conditions.

The experience has proved a good one for the design engineer, the buyer of steel castings and the casting producer. The good account that these castings have given of themselves has placed confidence in the designer towards specifying the use of castings more generally. The information obtained regarding the casting properties in the water-quenched and tempered state is doing much to acquaint the buyer with the possibilities of high strength castings and castings of increased toughness for post-war commercial service.

Also, the period of expanded production of quenched and tempered steel castings has contributed a great deal for the producer. He has learned much regarding the technique of water-quenching of steel castings such as, for example, the time quench, tank capacities, water velocities, quenching temperature, hardenability test control, etc. He has learned that castings of all sizes and of varying cross-sections can be water-quenched. In fact, he has learned that many of the past fears that he had of the water-quenching of steel castings were greatly exaggerated.

Also, the greater use of liquid-quenching has resulted in improvements in the mechanical handling of castings in various stages of the process, resulting in a more uniform product at a lower cost.

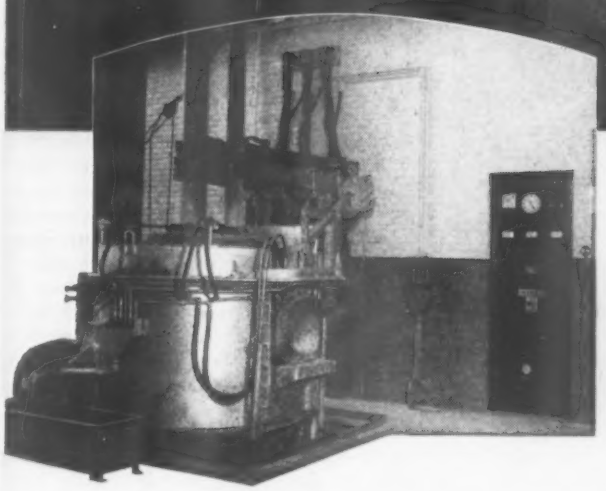
Future Is Bright

The future commercial use of water-quenched and tempered steel castings is bright. Casting buyers who have recently learned of the tremendous possibilities of the use of high strength castings probably will not return to the lower properties obtained by normalizing and annealing. Furthermore, it appears that buyers will insist upon specifications permitting higher strength grades, with including clauses on quenching heat treatment.

The producer of water-quenched and tempered castings will insist that specifications become more simplified as to heat treating requirements, and that there be no ban on liquid quenching. In fact, at present committees are working on the revision of the A.S.T.M. casting specifications with the foregoing points in mind.

Thus, it is possible to foresee an increased use of the water-quenching heat treatment for commercial steel castings after the war; for inasmuch as normalizing was the great improvement in the heat treatment of steel castings after the first World War, so the quenching treatment of commercial castings will be the major steel casting development resulting from this war.

Of course, it is not too wise to make predictions, but it is believed by the author that in a 10-year period following the present war, approximately 50 per cent of the alloy steel casting production will be produced for sale as liquid quenched and tempered castings.



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For Better Snagging

CORTLAND

PRODUCES MAGNESIUM CASTINGS

(*Continued from page* 73)

which might result in some sand being carried into the casting cavity. They also eliminate turbulence since the stream has to flow a short distance before entering the sprue. The pouring basins are not coated but are well sandblasted and preheated shortly before use.

Heating of the pouring basin usually is performed while the metal at the pouring station is cooling to the desired temperature. Fig. 10 shows one of the operators taking a temperature observation while the other is heating the basin. Thermocouples are checked for accuracy once a day to insure proper readings, and pouring temperatures are based on the size, section thickness, and intricacy of the castings. It may range from 1300 degrees in the case of extremely thick sections up to 1500 degrees in the case of thin, complicated sections.

Fig. 11 shows the actual pouring operation. First step after the temperature reaches the desired point is to clear away the slag or flux at the pot mouth so as to provide a clean area of about 6 square inches. This area is dusted with sulphur. The latter operation is continued on the stream issuing from the pot from time to time to prevent burning. Immediately after the casting are poured all sprues and risers are covered with molding sand which further reduces the emanation of fumes and steam, and as a consequence the pouring department is relatively free from such gases.

Many Chills Used

Mention was made previously of the use of chills both in the molds and in the cores employed for production of magnesium castings. One good example of chills in cores is shown in Fig. 13. The core is one of the 26 which enter into the mold for the rear case casting. While not apparent from the illustration, the core is rather complicated and requires 15 loose pieces, 7 reinforcing wires and 18 chills in its construction. Most of the chills can be seen clearly, as well as several of the loose pieces which remain in position until after the core is baked. This is necessary since the loose pieces form undercuts, and removal while the core is in the green state might result in collapse of those portions.

Fig. 12 shows a somewhat bulky, complicated core. It is termed a "finger" core since it has a projection extending from one end which looks like a crooked finger. This core also is employed in production of the rear case. It is made in two half core boxes, and the drag or lower half shown at the left required

(*Continued on page* 138)

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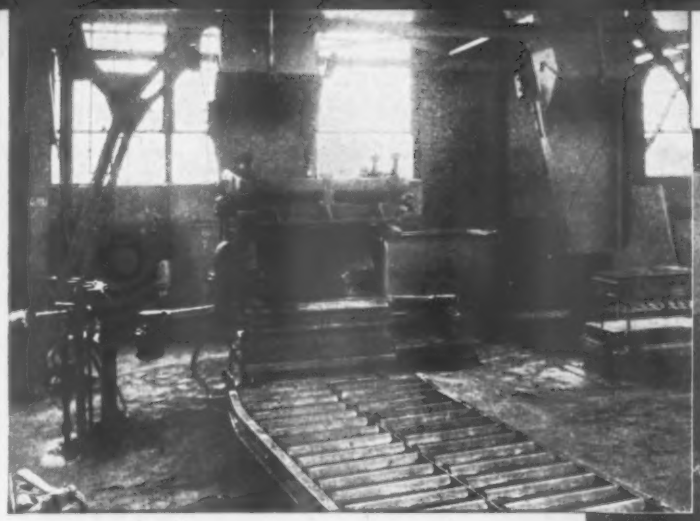

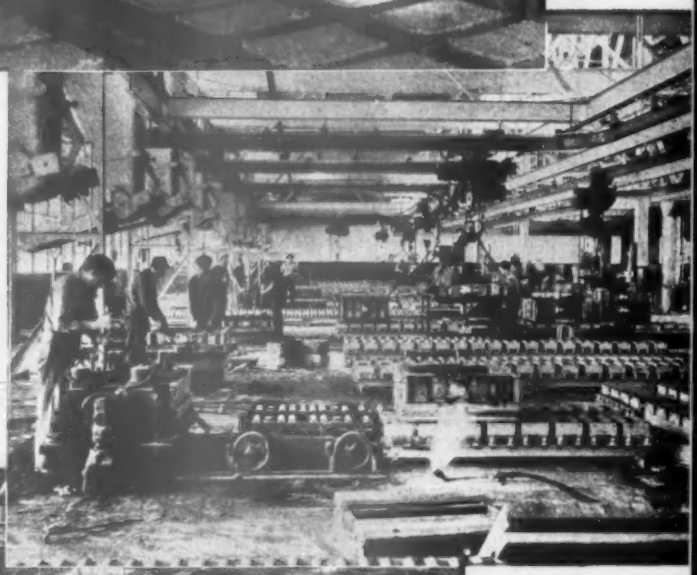

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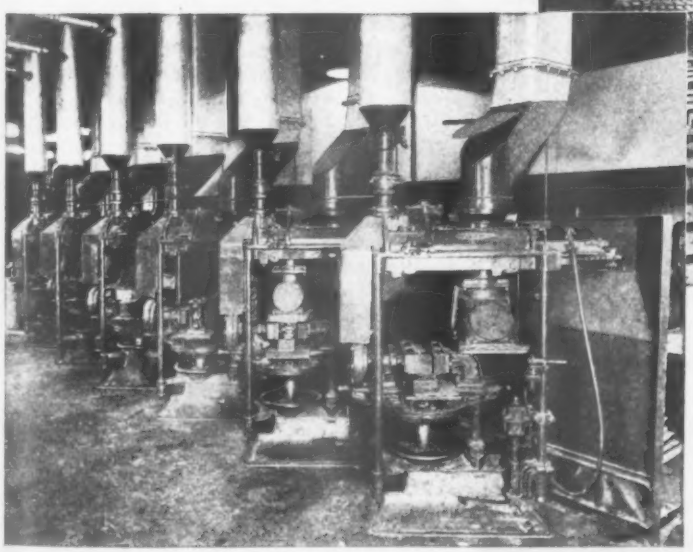

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(*Continued from page* 134)

5 loose pieces. The cope or upper half box at the right contains only 1 loose piece. The illustration shows the various loose pieces adjacent to the particular boxes as well as the 6 reinforcing wires employed to stiffen the core. A view of the core is included as well as the core drier at the extreme right.

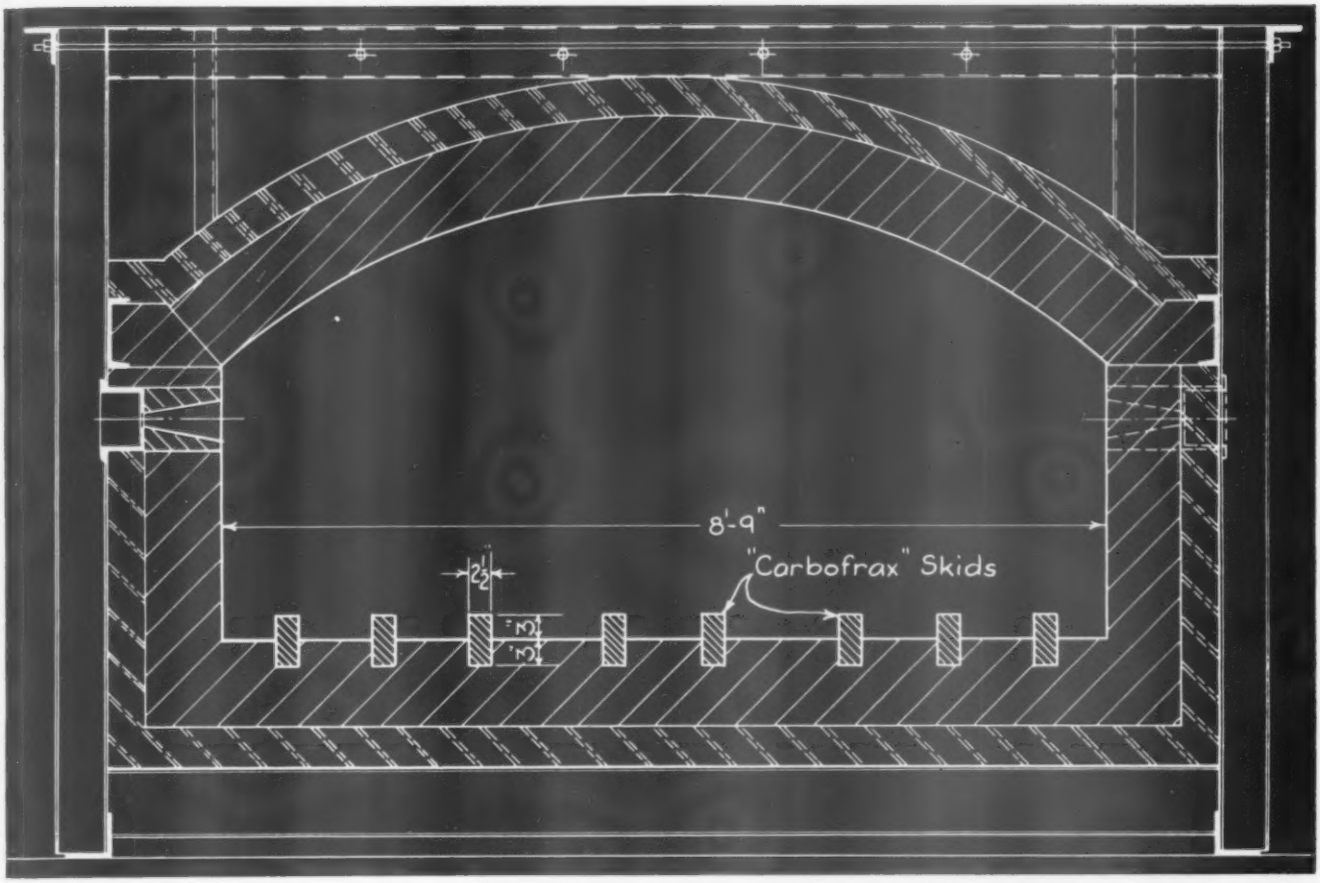
Most of the work in production and assembling of cores is performed by women. Experience has shown the company that they are just as adept, if not more so, than male coremakers. The only limitation on the kind of work they can handle is in lifting anything over 25 pounds. Hence, a few men are required to do that lifting. However, women make cores on hand-rollover machines with the rolling over performed by men moving from machine to machine —one man taking care of several machines in addition to removing the cores from the machine platen to the core racks. Partial views of the core assembling department are shown in Figs. 8 and 15, and those with Fig. 3, (THE FOUNDRY for April) will give some idea of the complicated cores and core assemblies employed in production of magnesium castings. Due to the type of castings made, close control is required in the coremaking department. Numerous gages and fixtures are used on the cores before and after assembly to insure that the final casting is within the limits specified by the consumer.

Castings Are Inspected

Earlier in the article it was stated that following shaking out the castings were subjected to rough inspection and then sandblasted. Then the castings again are inspected and forwarded to the cleaning department. Gates and risers are removed with band saws where possible, and with pneumatic hammers. The latter also are used to remove any fins and projections left from previous operations, as shown in Fig. 14. Chipping benches, as may be observed, are box structures of heavy plank which are almost completely open at the top. The holes in the side are for a supporting member on which the casting can rest, and through the use of other boards the castings can be adjusted to any desired position without difficulty. That is shown clearly in the illustration, by the different positions of the castings.

Following chipping the castings are ground and finished with rotary files to insure smooth surfaces. Those operations are conducted in booths similar to those in Fig. 9 which operate on the downdraft principle—the dust and shavings from the operations being carried down into a water spray which thoroughly wets the particles to form a sludge in the tank beneath. Such equipment is essential since magnesium dust is easily ignited, and may result in a serious fire or explosion. On completion of the finishing operations the castings again are inspected, and then heat treated. After heat treatment the cast-

(*Concluded on page* 140)



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"CARBOFRAX," the Silicon Carbide Super Refractory by Carborundum, has done it again! Used as skid rails in this box type heating furnace, it has already given more than twice the service of the alloy rails formerly utilized—and is still going strong! And "Carbofrax" has done it under particularly tough operating conditions.

The job is to heat steel rings weighing as much as 800 lb. each to 1600° F.-1800° F. preparatory to sizing and shaping. When alloy rails were used they warped and became so badly deformed that they had to be replaced in less than six months. "Carbofrax" rails, however, are still operative after more than a year.

Through the use of these refractory rails, production from this furnace has increased. Maintenance costs have dropped, too. But of equal importance is the fact that the "Carbofrax" skid rail installation costs less to begin with.

With more and more operators of heating furnaces using "Carbofrax" skid rails, we have a wealth of performance data available. A note will bring you the complete story.

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. Let's get it over with—quickly!

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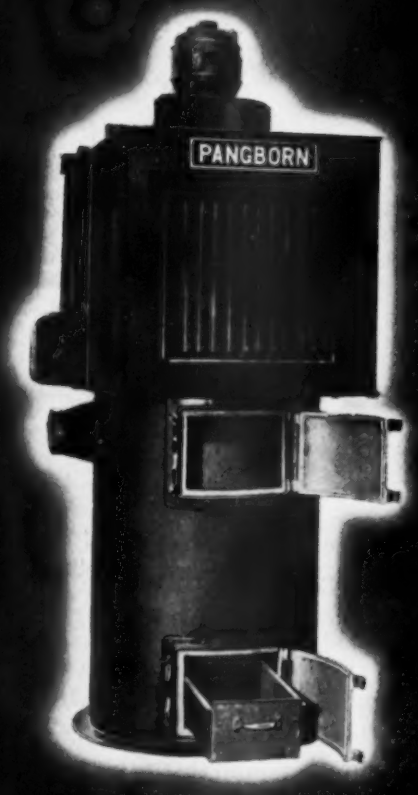

A FEW OF THE MANY NEW FEATURES

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Arrangement details, operating data and photographs are available in Bulletin No. 910. A copy will be sent to you upon request—no obligation, of course!

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PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.

(*Concluded from page* 138)

ings are inspected once more, and if they are to withstand pressure, they are subjected to pressure tests. Then the castings are given a dichromate pickle for protection against corrosion, and are ready for shipment.

Sand used for molding is made from silica sand bonded with bentonite, and is handled in a closed system which is compact and effective. It drops from the shakeout on a short belt which travels over a magnetic pulley. The latter removes any wires and chills which may not have been caught on the shakeout screen. From the belt the sand falls into the boot of a bucket elevator which carries it up to a hexagonal revolving screen located over an 18-ton storage bin. The screen separates any coarse material such as core butts, etc., from the molding sand, which then passes through into the bin. The coarse material is carried down the screen to a chute.

Bottom of the storage bin contains a batching hopper from which the sand can be distributed into either of two mullers. In the mullers additions are made of inhibitors and moisture to bring it up to the standard requirements, and sand tests are made on every batch to check the results. From the mullers the sand is fed on to conveyor belts which transports it to the various molding stations.

OPA Appoints Steel Cost Group

Comptrollers or auditors of seven steel foundries have been appointed by the OPA to a standing subcommittee on costs of the Steel Castings Industry Advisory Committee. The group will advise OPA and members of the general committee on matters connected with a proposed cost study covering industrial castings. No investigation of costs on wartime work is contemplated at present.

Members of the subcommittee are: Harry McClees, Crucible Steel Casting Co., Lansdowne, Pa.; Clarence A. Porter, Sawbrook Steel Castings Co., Lockland, O.; George Alston, General Steel Casting Corp., Eddystone, Pa.; J. L. Daugherty, Union Steel Casting Co., Pittsburgh; H. L. Holtz, Sivyer Steel Casting Co., Milwaukee; August C. Christiansen, Pratt & Letchworth Co. Inc., Buffalo; George W. Sanlen, Caldwell Foundry & Machine Co., Birmingham, Ala.

Grievance Settling Methods Described

A report summarizing the experience of various corporations and labor unions in working out grievance machinery in their collective bargaining units has been prepared by the U. S. Department of Labor. Entitled "Settling Plant Grievances," it is available on request.

X-RAY PROCESS ENGINEERING

(*Continued on page* 74)

diographic film entirely suitable for radiography of light alloy castings. The finest grain film obtainable should be utilized at all times. While the finer the grain the slower the film, it is relatively easy to penetrate the lighter alloys, and for such metal it is possible to use fine grain film at all times for greater detail.

Distinctness of radiographic detail and sensitivity is governed by image sharpness and by contrast, and particular attention should be paid to proper type of film suitable for the metal under examination.

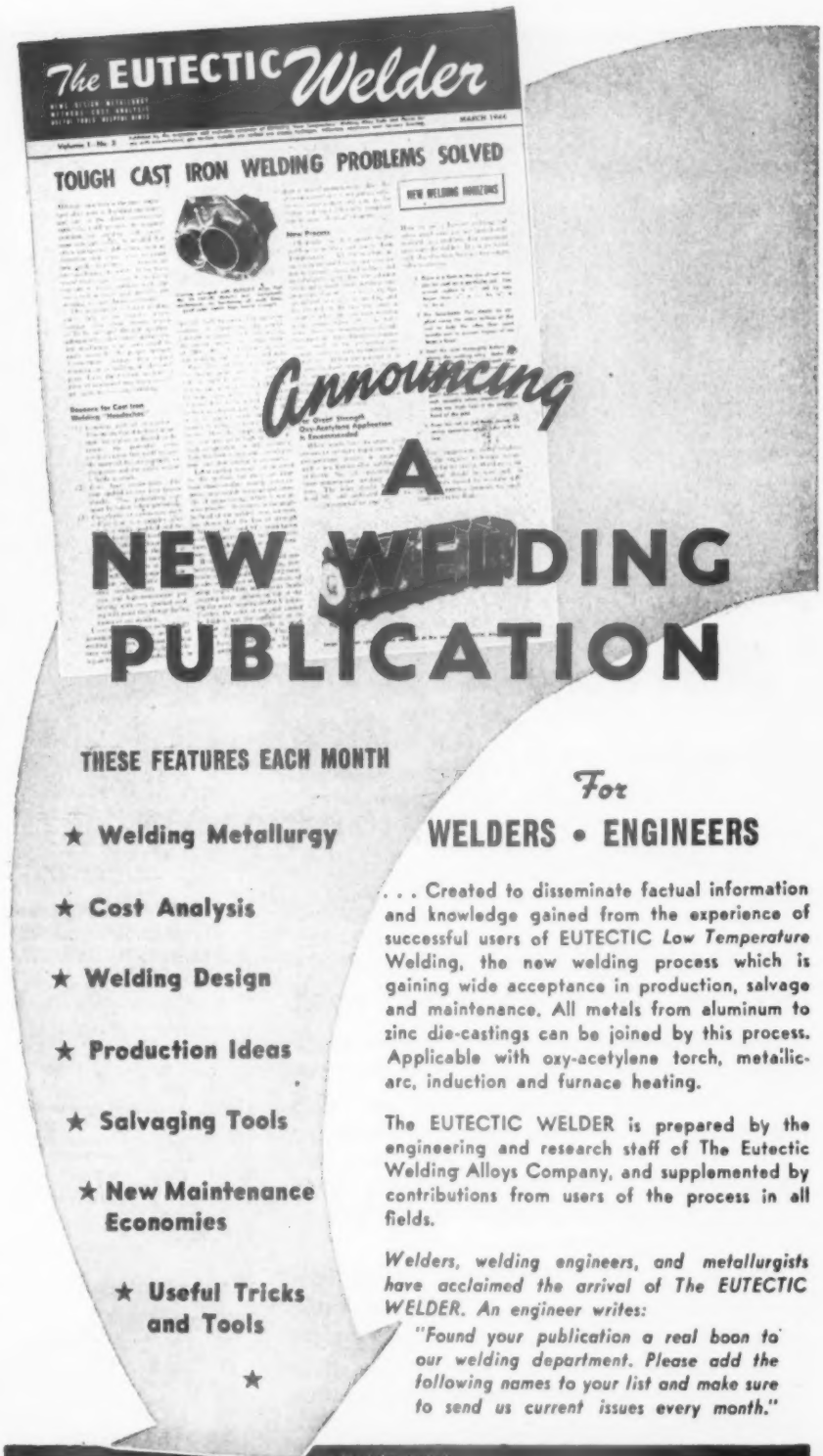
In connection with the use of lead foil screens it should be pointed out that lead foil possesses both absorption and intensification properties when excited by x-radiation. Intensification is dependent on the hardness of the radiation. Such hardness, necessary to obtain intensification with lead foil screens, is dependent upon both the kilovoltage and the thickness and type of material under examination. In the radiography of aluminum, for example, the casting thickness must be close to 6 inches and kilovoltage as high as 160 to secure any advantage. However, these screens do offer a valuable absorbing coefficient in radiography of aluminum sections over 1 inch thick where secondary radiation at times is excessive. As a rule these screens are composed of 96 per cent lead and 6 per cent antimony alloy foil.

Set Up the Dark Room

In the processing room where exposed films are developed tank insert capacity of course is governed by number of films to be processed per hour or per day. In setting up this so called dark-room consideration must be given also to dryer capacity. The most satisfactory manner in which to plan the processing room is to estimate the number of exposed films that may be handled per hour and multiply by 2, so that as work in the department is speeded up the processing room will not fail to handle its share.

Hydrodynamic design of the master tanks and inserts is of special importance as a clear flow of water must be maintained at correct temperatures for cleanliness and control of processing solutions. Film dryer capacity of course should be adequate, although this factor often is neglected.

Interpretation is a painstaking work and must be carried on with entire confidence in the procedures being followed in the laboratory. Methods must be standardized on precision techniques, and film quality must be maintained at a high standard for proper and accurate interpretation. A knowledge of radiographic shadow formation, appearance of various types of defects associated with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. . . Created to disseminate factual information and knowledge gained from the experience of successful users of EUTECTIC Low Temperature Welding, the new welding process which is gaining wide acceptance in production, salvage and maintenance. All metals from aluminum to zinc die-castings can be joined by this process. Applicable with oxy-acetylene torch, metallic-arc, induction and furnace heating.
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Sweat robs the body of essential salt. This loss of salt dehydrates the body. It thickens the blood. Throws body fluids out of equilibrium. The result is Heat-Fag. Workers are tired, easily fatigued. They lack the "drive" that keeps production soaring.

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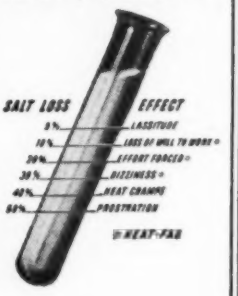

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metals, and the ability to decide location of a defect in its relation to ultimate strength of the casting are essential for this work.

It is also necessary that prints be available to the interpreter in order that he may associate a defective casting with its final function and stress requirements.

Static tests should be performed on all questionable defective castings and standards set up as future criteria for interpretation. Tests are not required on castings exhibiting such defects as cracks, miss-runs and cold-shuts, this type of reject being cause for rejection on the basis of x-ray examination alone. Other defective castings are machined and static tested prior to final rejection.

It is important that designing engineers acquaint themselves with radiographic examination of castings for airframes for subsequent design changes. In this instance it is important that visits to the x-ray inspection laboratory be made by the engineers for the purpose of correlating radiographic inspection with design.

Foundry control is extremely important to radiographic inspection. The founder may deduce much valuable information from radiographic examination of his product. The foundryman working with the x-ray process engineer may deduce certain information relative to changes that may be made in foundry technique which will result in eliminating defective material because of faulty casting procedure. In the event the foundryman cannot personally visit the laboratory and view radiographs of his product, should be the duty of the laboratory to specify in writing the type of defect noted in a particular run or heat and submit opinions to the foundry for improvement in casting methods.

In brief the designing engineer, structures engineer, the foundryman and the x-ray process engineer share duties of equal importance. Co-ordination between each separate department will lead to accomplishment beyond the horizons of expectation at this time.

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Names Sales Agent

Cleveland Quarries Co., Cleveland, has appointed the Firegan Sales Co., Board of Trade building, Chicago, as representative for the sale of Buckeye silica firestone in Illinois north of Springfield, and Lake, Porter and LaPorte counties, Indiana.

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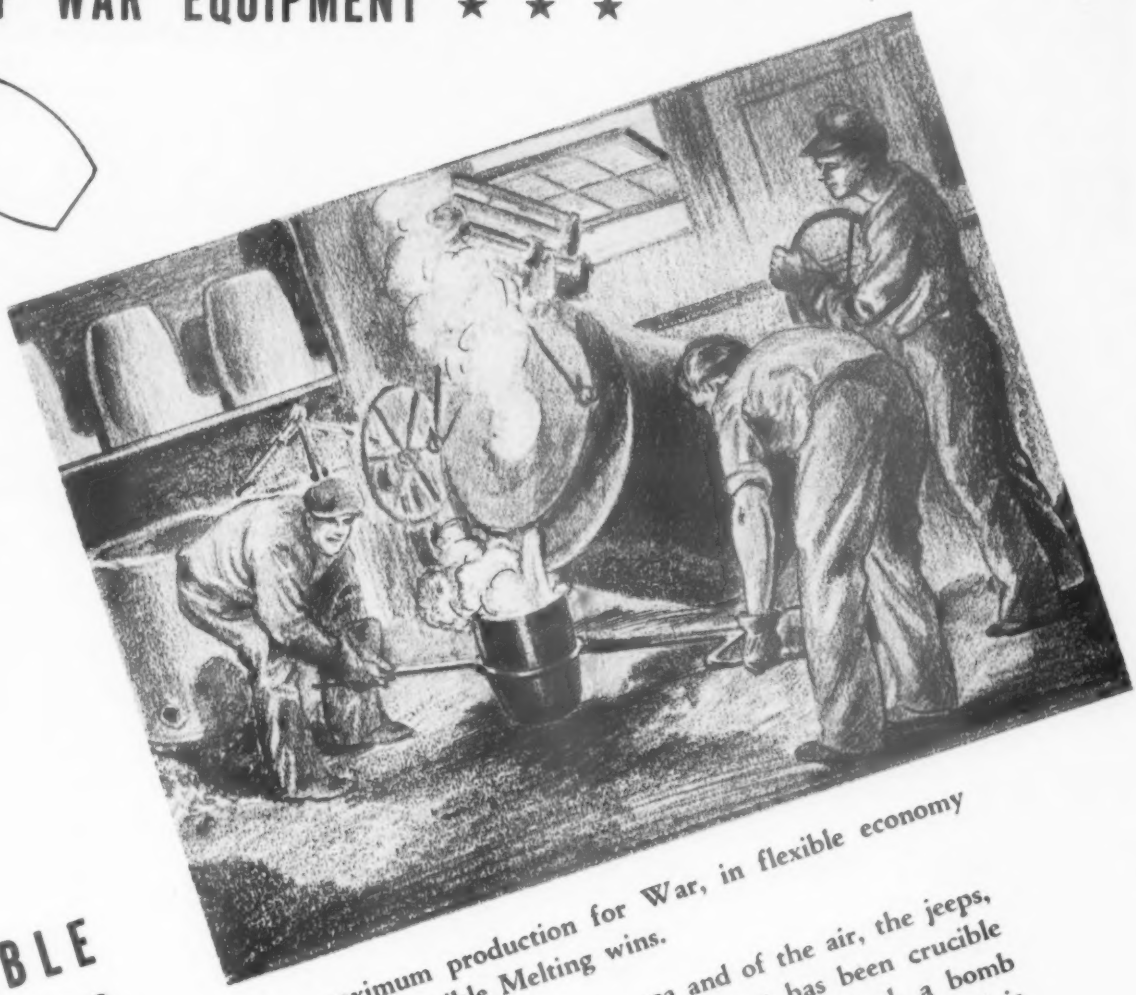

From a photograph of a tilting crucible furnace with crucible for carrying and pouring.

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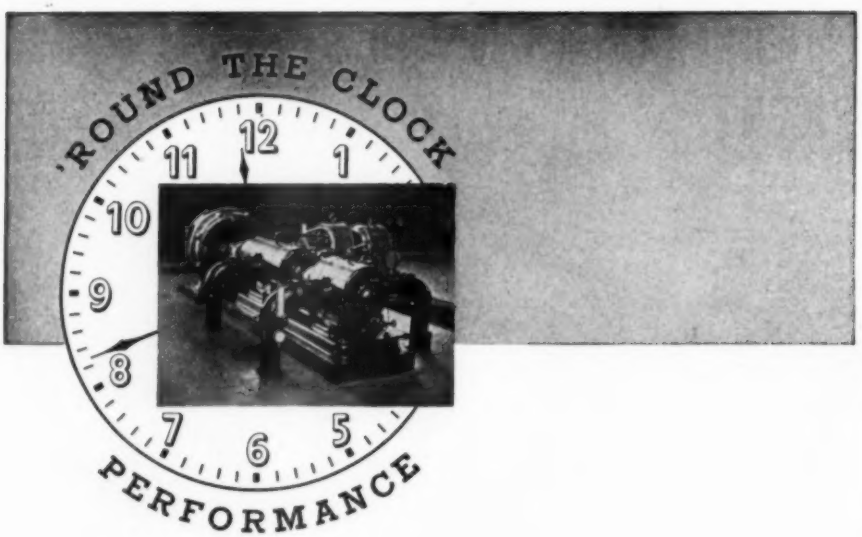

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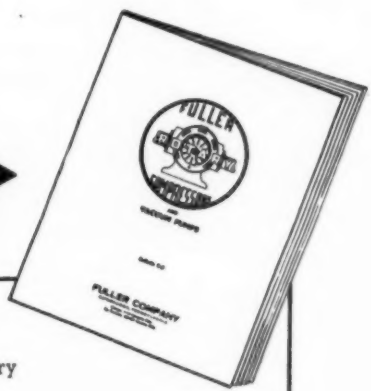

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GRAPHITIZATION OF MALLEABLE IRON

(*Continued from page* 61)

after the charge is melted to obtain uniformity throughout the melt and a metal temperature of 2750 to 2850 degrees Fahr. This practice increases the carbide retentivity during the solidification of the casting.

It is not uncommon for irons with from 1.40 to 1.70 per cent silicon and from 2.00 to 2.40 per cent carbon to show no mottling in sections up to 1 inch. Such irons can be annealed commercially in about 15 hours. Therefore, it is practical to obtain satisfactory castings, of even fairly heavy sections, which malleablize in less than a day, by raising the silicon content and by setting up melting practices, which evidently can be worked out for any foundry, to avoid mottling.

Examine the Carbon

Carbon is the second element among the composition factors that may be examined regarding its effect on graphitizing rates. The general opinion is that, for all practical purposes, the total carbon content of the iron has no effect on the rate of graphitization during the first stage. It is possible through coarsening of the carbide particles or through increasing the number of carbides that higher total carbon contents may change the graphitizing time during the first stage, but all evidence indicates that the effect of total carbon content on this stage is unimportant. It is not clear whether carbon will affect the time required for second stage graphitization, though it would seem that if the number of graphite nodules or nuclear centers is increased progressively by higher carbon contents, then the rate of graphitization also should increase progressively.

Various alloying elements have been used in malleable iron for one purpose or another. Most of them influence the graphitizing time. They appear to have distinctively individual graphitizing powers regarding the formation of mottled structures and during the annealing cycle. Some are more effective in producing mottling during solidification than in promoting graphitization during the first and second stages. Others appear to be more effective in the second stage than in the first stage of graphitization.

Manganese in more than normal quantities, is an element which at first was felt to have little, if any, effect on the graphitization rate during the first stage. It is now realized that high manganese contents will retard graphitization moderately during that state as well as to retard graphitization very effectively during the second stage. As shown in Fig. 4 the time required to graphitize a defi-

(*Continued on page* 148)

How We Keep Perfect Control of Ingot Specifications

The curve chart above, calculates the exact quantity of every element in a Michigan Smelting non-ferrous alloy. It is plotted from data supplied by a Spectrogram as read on the Densitometer in our laboratories. This quantitative analysis is made from a sample drawn from the furnace charge, taken while the metal is still molten—speeded to the Spectrograph where the spectral lines are photographed. Thus, before a single ingot is poured, we can determine and make certain, that the alloy in question meets every specification requirement—is made exactly as ordered

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Adams Cherry Slip Flasks and Adams Aluminum Slip Flasks are custom-built to your specifications, with any desired length, width or depth.

Trimmings are accurately machined and can be adjusted to compensate for wear. The sand strip mechanism is quick-acting and convenient and it will stand up under the jolting and squeezing of power machines.

Pins to suit your preference — wide-V, double-V, round, double-round or special types, accurately machined on bearing surfaces.

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The unique patented construction of the Adams Cast Iron or Aluminum Jacket, combining horizontal and vertical corrugations, provides great strength and rigidity with minimum weight.

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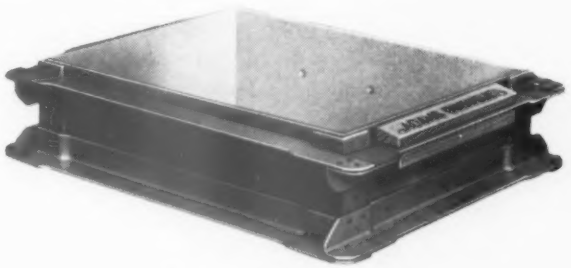

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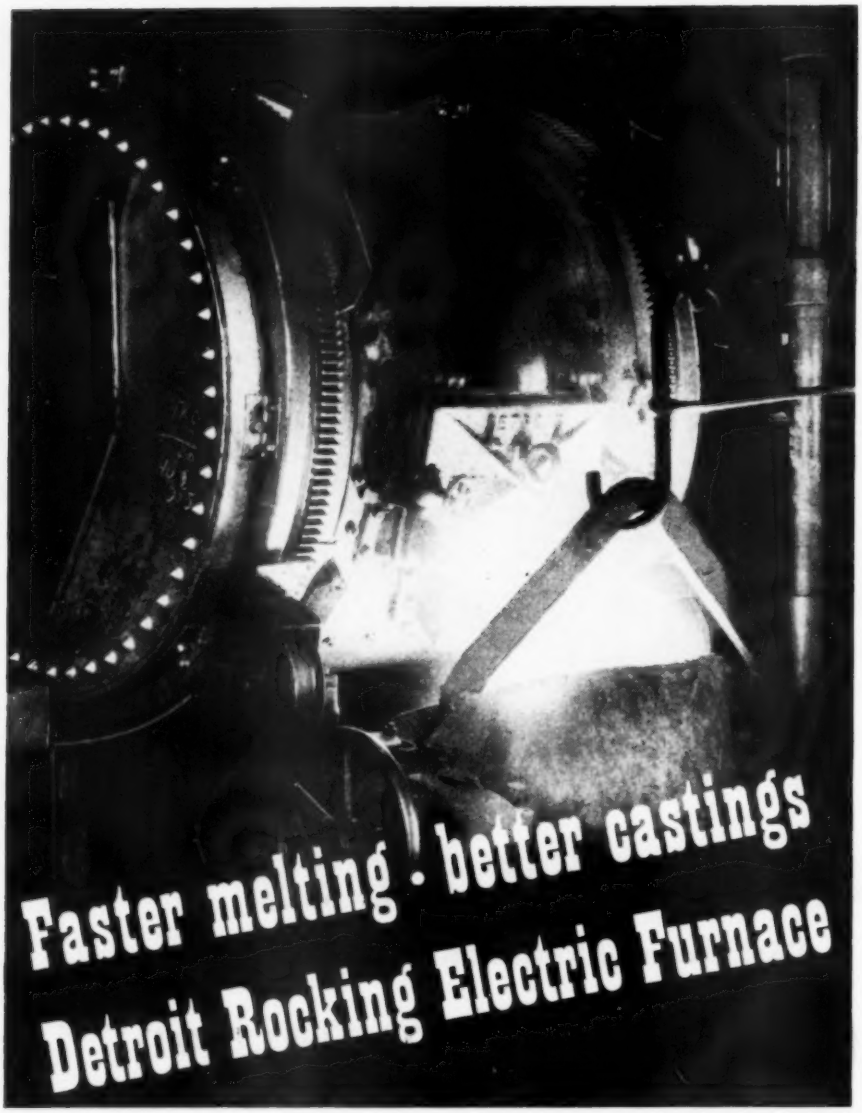

When that white hot metal leaps into the ladle from a Detroit Rocking Electric Furnace you can safely bet 50 to 1 you've got a perfect heat — for precise metallurgical control of every heat is comparatively easy with a Detroit Furnace. And you foundrymen know what that means: lower metal losses, less labor, more pounds produced per man hour, a higher percentage of perfect castings of uniform quality. And as to speed, here's a fact worth noting: with a Detroit Rocking Electric Furnace you can pour as many as 8 ferrous or 16 non-ferrous heats in one eight-hour day. Each heat may be of the same, or of a different analysis. Each heat will be poured with a minimum of dirt, fumes and hard work.

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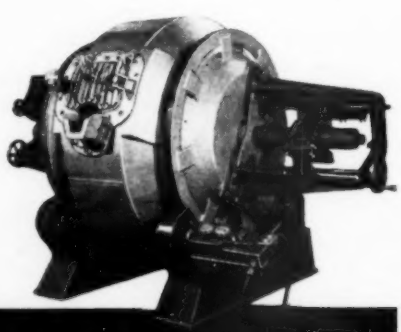

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 144)

nite percentage of combined carbon, at temperatures below the critical, increases rapidly as the manganese content is increased.

Manganese is being used in some pearlitic malleable irons to reduce the rate during second stage graphitization. This is done to permit greater uniformity of product from large scale commercial operations as well as to facilitate spheroidization to improve ductility. Such irons may contain 0.6 to 1.00 per cent manganese in contrast to the usual maximum manganese content of 0.35 per cent for standard malleable. It is surprising that the addition of the extra manganese appears to promote mottling, but that seems to be the case when the manganese is added to the ladle. This is directly opposite the effect of manganese on graphitizing iron in the solid state. Manganese contents must be controlled within close limits to attain high rates of graphitization.

Copper May Be Added

Copper is one of the few elements besides manganese and molybdenum that may be added intentionally to malleable iron. It not only increases mottling tendencies, but also affects the annealing behavior by moderately reducing the stability of the carbide. Therefore, it accelerates graphitization in the first and second stages. One direct effect of copper is to decrease the graphite nodule size, giving more centers for the graphite to precipitate. In this respect it resembles silicon. Small nodules are preferred if carbide elimination is to be rapid. In the opinion of MacMillan, 1 per cent copper is just about as effective from the standpoint of annealing as 0.5 per cent silicon and is equivalent to only about 0.1 per cent silicon from the standpoint of inducing primary graphite.

This would indicate that malleable producers, desirous of reducing the malleablizing time may add 1 per cent of copper and reduce the silicon content 0.1 per cent to avoid mottling, and by so doing obtain an iron which will graphitize as rapidly as an iron with an additional 0.4 per cent silicon. Earlier, the powerful effect of silicon on graphitizing rate during both stages of annealing was mentioned. It is apparent that copper also can reduce the annealing time appreciably. Copper is an example of an element which, when added to malleable iron, exhibits a graphitizing power during solidification not necessarily equivalent to its graphitizing power during annealing.

A second prime factor controlling the graphitizing rate during the first stage is temperature. Graphitization proceeds at a progressively increasing rate as the annealing temperature is raised. In this respect, the temperature effect runs parallel to the silicon effect; the relative graphitizing rate increasing logarithmically with temperature. As a rule, irons malleablized with a high initial annealing temperature show smaller and more numerous graphite particles than irons

(*Continued on page* 150)

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Operations
DEMAND THE BEST
And "the best" in Chaplets, Chills and Superchills (patented) has long been identified with the fine old name of Fanner.
Today, more than ever, when there can be no compromise with either time or quality in turning out the best possible castings in the shortest possible time, the need for these vital Fanner products is a very essential "must" in every successful production speed-up.
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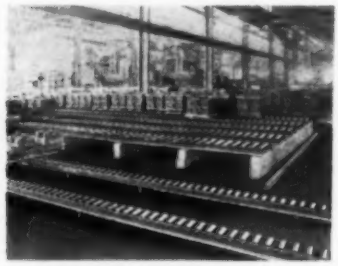
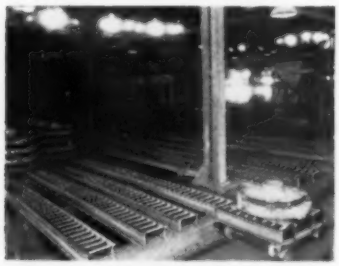


The rugged construction of Standard Conveyors with sealed bearings assures long service life. Gravity roller Conveyors pictured here serve for storage of molds and flasks and bring castings to and from machines in various operations.



Increasing productive time by reducing handling operations—saving manual effort and contributing to the safety of workers—eliminating congestion and making working space more useful—these are but a few of the many ways Standard Conveyors have aided foundrymen in their wartime record of accomplishment.

Standard engineers are pioneers in foundry conveying—have designed and developed a variety of special equipment for foundry handling.

(A valuable reference book, "Conveyors By Standard" F-54, is available on request, to foundry executives.)

STANDARD CONVEYOR COMPANY
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(*Continued from page* 148)

malleablized at a lower temperature. When furnace operations are consistent with reasonable furnace life and with freedom from excessive casting distortion, higher annealing temperatures may be preferred not only because they shorten the first stage of graphitization, but because they also favor more rapid graphitization during the second stage as a result of the closer spacing of the graphite particles.

Besides the factors of composition of the iron and the temperature of annealing, there are a host of other factors associated with the raw materials and the control of the melting and annealing processes that profoundly affect the graphitizing rates.

Boegehold and later Joseph, in discussing raw materials for malleable heats, stated that, within their foundry, control of the iron to obtain close packed temper carbon nodules is done by selecting the silvery pig iron used in the cupola charge. They are not certain what factor in the pig iron is responsible for this action, but the desirable or undesirable characteristics can be obtained at will by merely switching pig irons. The effect of such desirable and undesirable characteristics are illustrated in Figs. 5 and 6 respectively showing the annealed structures of two commercial, short cycle malleables of substantially the same composition given the same annealing cycle. The difference in size of the temper carbon spots and the incompleteness of the anneal in one case manifest the variations in response of the irons to malleablizing.

Steel Has Definite Effect

Steel additions to the charge, while they may not affect the final analysis of the iron, appear to increase the carbide-retaining power. The ability to use higher percentages of carbon and silicon in the duplex process, for example, is attributed to the greater carbide-retaining power of the iron resulting from the use of larger quantities of steel. It is also conveivable that the iron is heated hotter in duplexing. This latter factor alone would tend to stabilize the carbide. In some cases, duplexed iron contains as high as 2.90 per cent carbon and 1.30 per cent silicon without mottling in relatively large sections.

Because increasing the temperature of the molten iron has a strong carbide-retaining effect, so far as mottling is concerned, it is possible, with hotter iron, for the silicon content to be raised without experiencing mottling. Similar effects are obtained by lengthening the time before the metal is cast. This stabilizing effect on the carbides of superheat and time at superheat during the freezing of white iron is exceedingly important because of its influence on the permissible silicon content of the iron.

The remarkable feature is that superheating, in spite of its tendency to prohibit mottling, actually reduced the time for malleablizing. According to White and Schneidewind, (Fig. 7) the

(*Continued on page* 152)

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(*Continued from page* 150)

annealing cycle can be shortened as much as 10 to 50 per cent by superheating, an effect which can be achieved without a change in composition. Therefore, superheating is one of the few variables known which helps to avoid mottling and at the same time causes white iron to graphitize more rapidly. In some respects, it ranks in importance with silicon and annealing temperature in its effect on the malleablizing process.

Up to this point the influence of superheat on accelerating the malleablizing process was considered only from the viewpoint of its effect on the graphitizing rate. Another feature is that superheat counteracts mottling, as mentioned previously, and permits the silicon to be raised so that the graphitizing tendencies of the iron are increased by virtue of higher permissible silicon contents. Therefore, to those eager to shorten the annealing cycle, superheating would offer unique possibilities. Naturally, there will be problems to work out in adapting superheating to practices within a foundry. However, the benefits from superheating are real and somewhat of a challenge to control the metal in the furnace so as to produce iron free from mottling that can be annealed at an exceedingly fast rate.

Produces Smaller Crystals

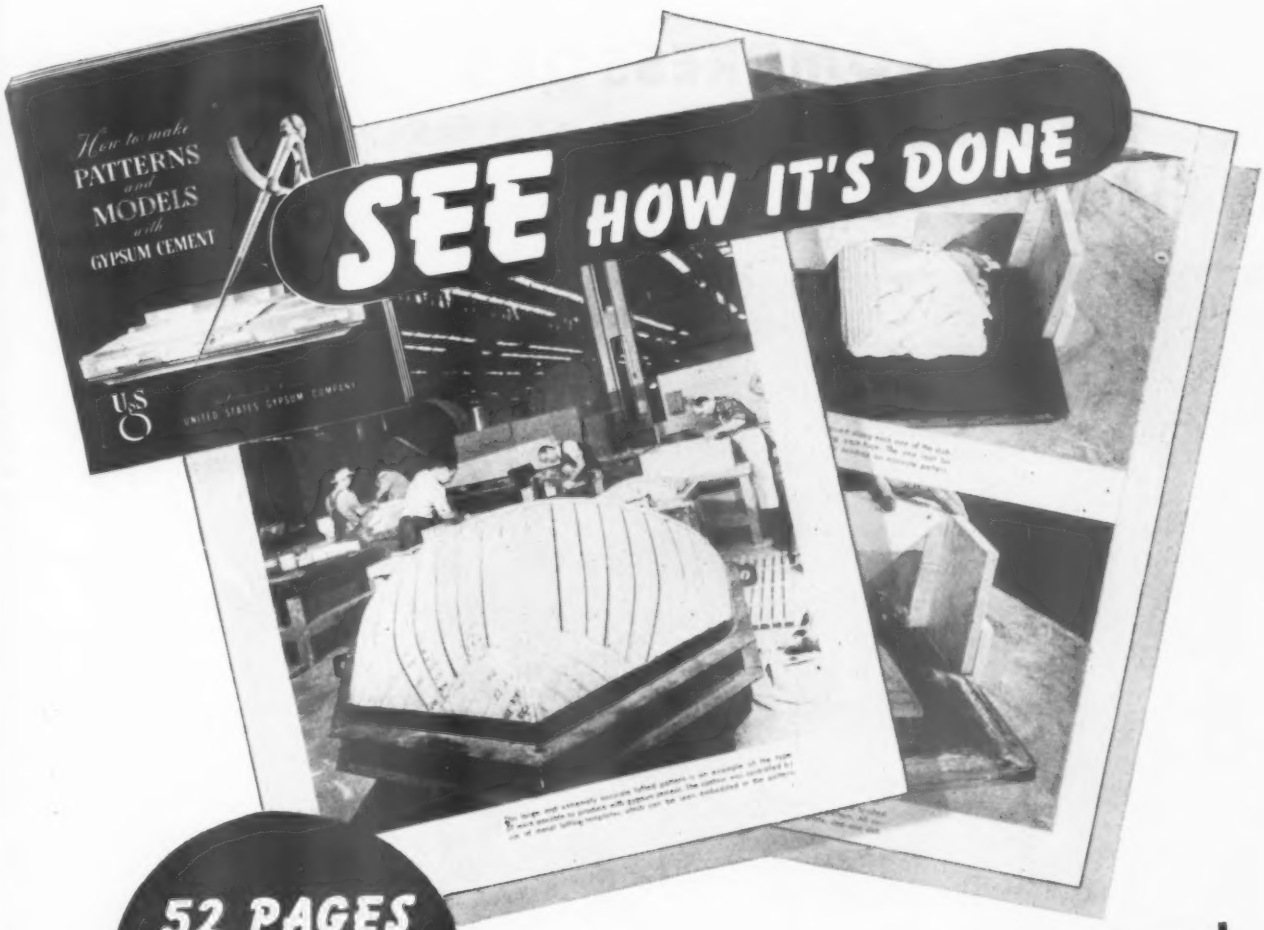
Schneidewind expressed the opinion that superheating causes the iron to supercool, and it in turn induces the formation of smaller crystals, and, consequently increases the tendency for the carbides to graphitize. Such irons invariably anneal with fine, closely packed temper carbon particles.

As a general rule, the structure of white iron coarsens with slower freezing rates or with increased size of section. Coarsening of the structure reduces the annealing rate and tends to develop large, widely separated temper carbon spots during annealing.

Time required for graphitization increases greatly as the distance between temper carbon spots increases. A number of factors are known to affect this distance, increasing the size of the spots when the distance is large, and refining the spots when the distance is small. The effect of superheating on refining the temper carbon pattern has been mentioned. It is also generally true that the lighter the casting and the faster the metal solidifies, other conditions being constant, the smaller will be the nodule size. Increased annealing rates are reflected in more numerous and more closely packed temper carbon spots.

Boegehold has shown that iron oxide additions tend to make the temper carbon spots larger and farther apart, especially toward the center of the casting where the solidification rate is slower. Similar results, for some unknown reason, are sometimes obtained with changes in raw materials used in the charge. Joseph, in a recent exchange paper, attributed effects, similar to those just mentioned, to

(*Continued on page* 154)



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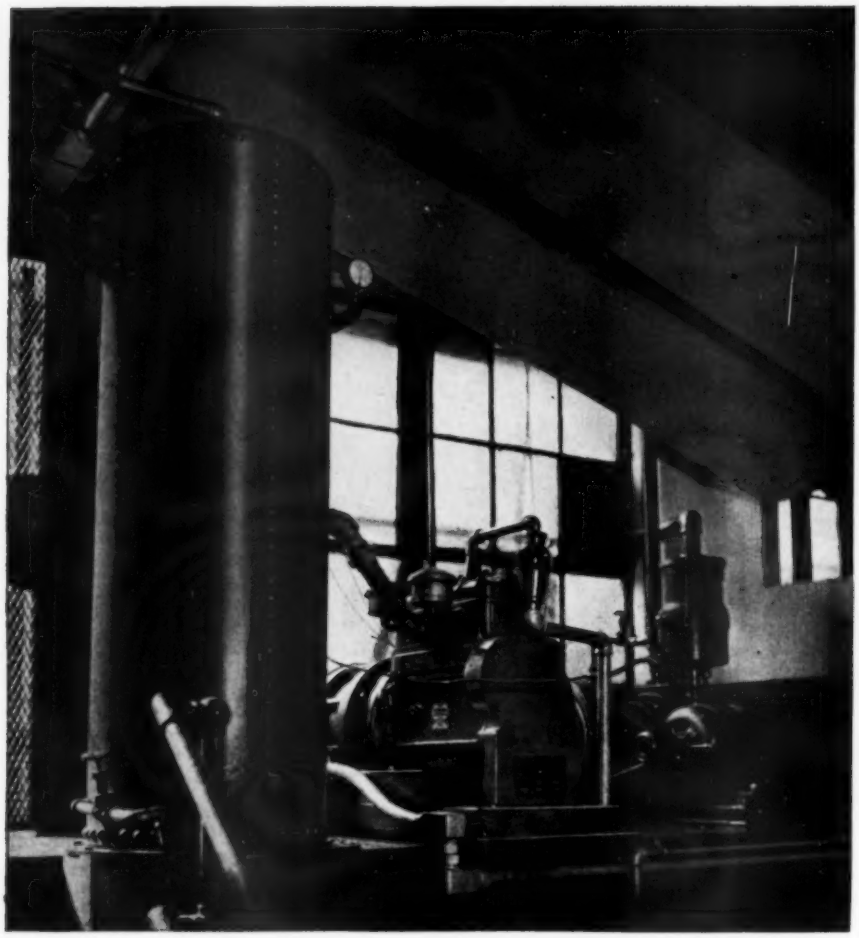

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(*Continued from page* 152)

differences between the structural character of the silvery pig iron used in the furnace charge. Silvery iron, according to Joseph, with a fine crystalline fracture is prone to give irons which anneal rapidly, while coarsely crystalline silvery iron is likely to lengthen the annealing time. A certain heritage from the raw materials seems to prevail.

Various alloy additions to white iron refine the temper carbon pattern. Copper is an excellent example of such an element. Not only does it increase the rate of annealing by virtue of its effect on the stability of the carbide, but also it has a definite refining action on the size of the temper carbon spots. Ladle additions of small amounts of aluminum, titanium, or zirconium definitely refine the white as well as the annealed structure of the iron, causing it to anneal much more readily.

There are various treatments or practices which when applied prior to annealing vary the rate of annealing of white iron. Low temperature pouring, for example, is said to produce fine-grained iron suitable for short-time malleablizing. But much more effective, in the production of short-cycle malleable, is the practice of heating more slowly to the annealing temperature to produce fine, close-packed, temper carbon spots to facilitate annealing. In this regard, Boegehold reported that with a heavy section, 1⅞-inch thick, when heated to 1700 degrees Fahr. at a rate of 228 degrees Fahr. per hour, 25 hours were required to complete first stage graphitization as compared to 5 hours when heated at the rate of 36 degrees Fahr. per hour. This comparison shows the importance of the speed of heating to the malleablizing temperature on the malleablizing rate. The effect of heating rate is said to vanish in certain practices, when silvery iron in the furnace charge is fine grained.

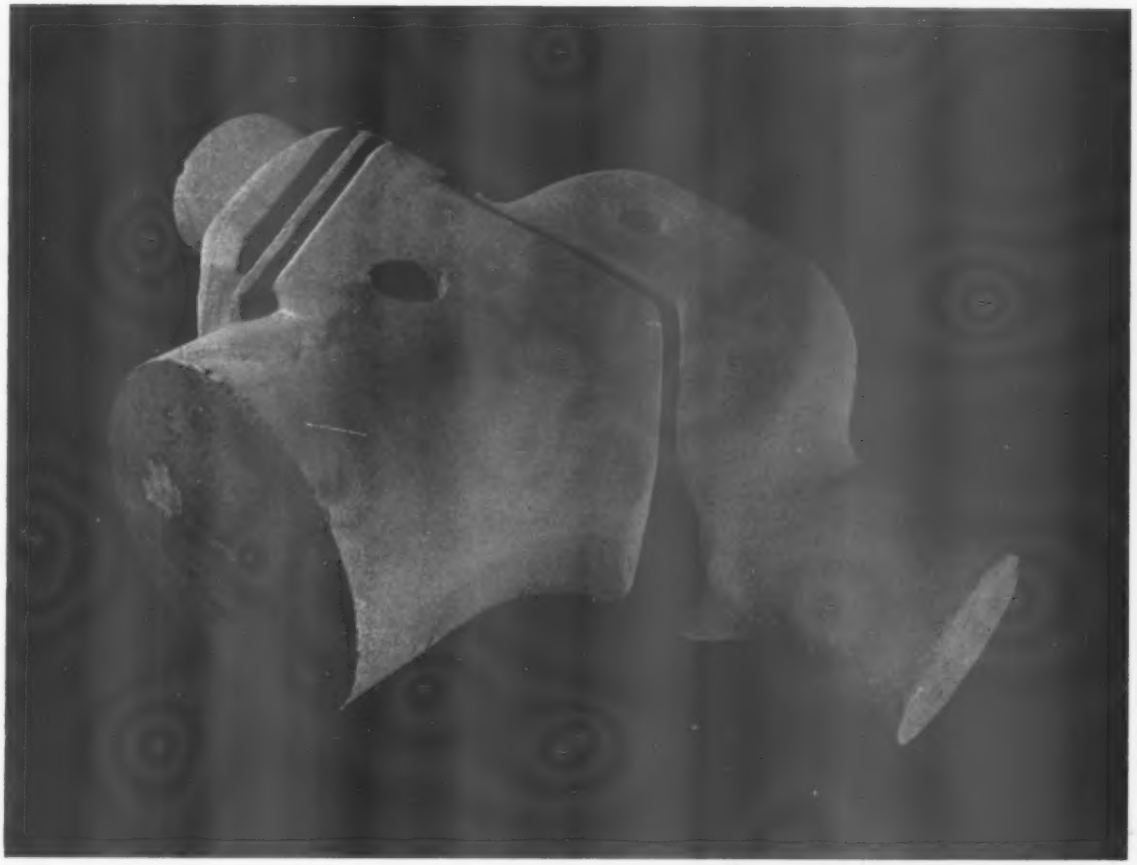
Extra Time Not Warranted

Crafts has found that a preliminary treatment of the white iron at a temperature between 200 and 750 degrees Fahr. for a period of time materially increases the graphitizing rate and favors the formation of small temper carbon particles. Treatments at 600 degrees Fahr. of 3-hour duration have been very effective in this regard. Although a longer time of heating at this temperature increases the effectiveness of the treatment somewhat, the improvement is hardly of the extent that the extra time would be warranted.

An even more pronounced effect of the low temperature treatment is experienced with copper in the iron. Copper and low temperature pretreatment complement each other in accelerating graphitization in the first and second stages, the pretreatment being especially effective during the second stage. As an example, when irons with 0.6 to 1.2 per cent copper were subjected to pretreatment, the nodule size was reduced drastically and the irons graphitized in an exceedingly short time. Variations in the rate of heating to the annealing temperature had

(*Continued on page* 158)

Lion Binder is a Core Binder



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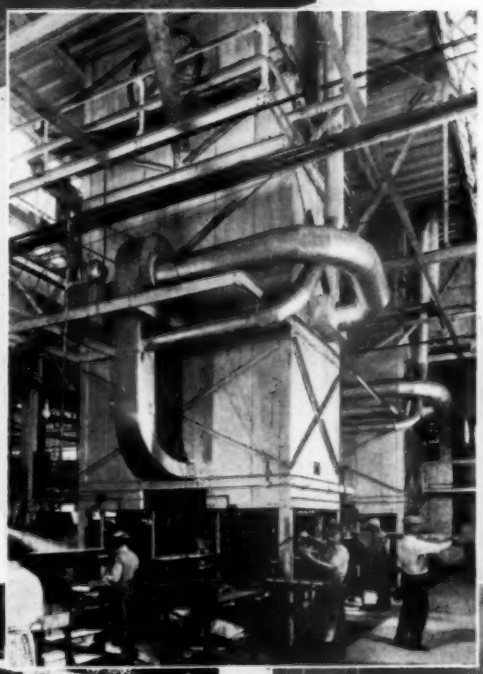

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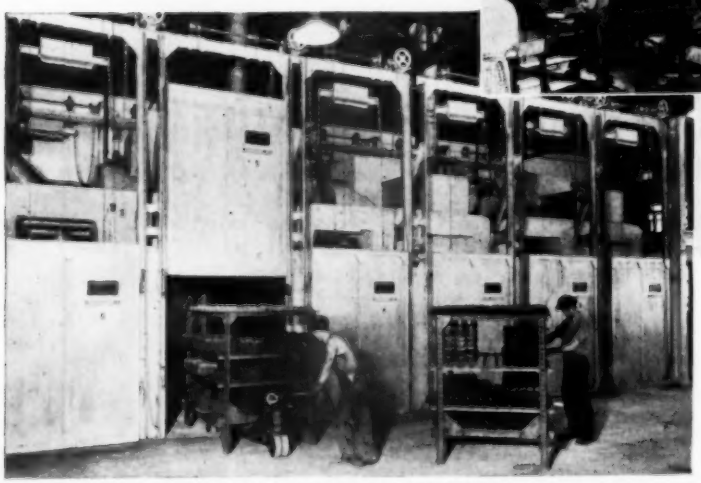

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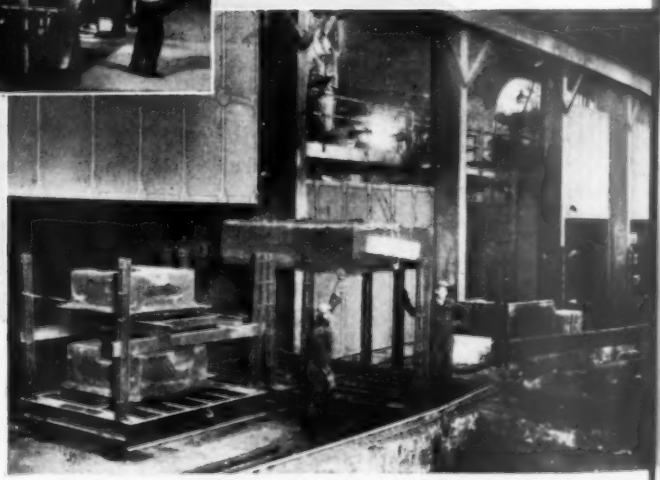

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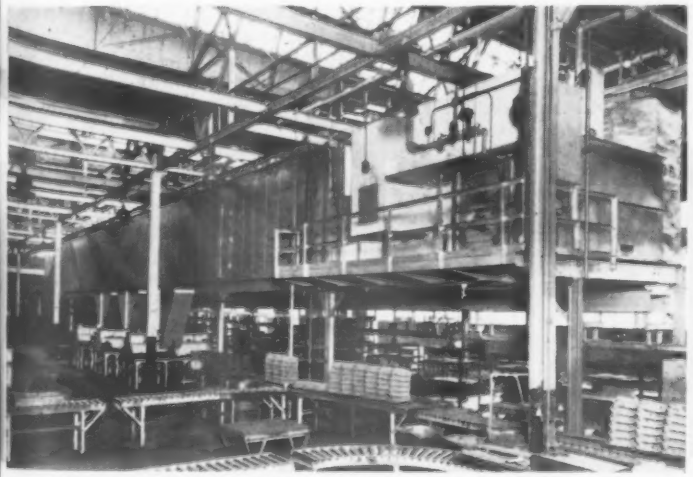

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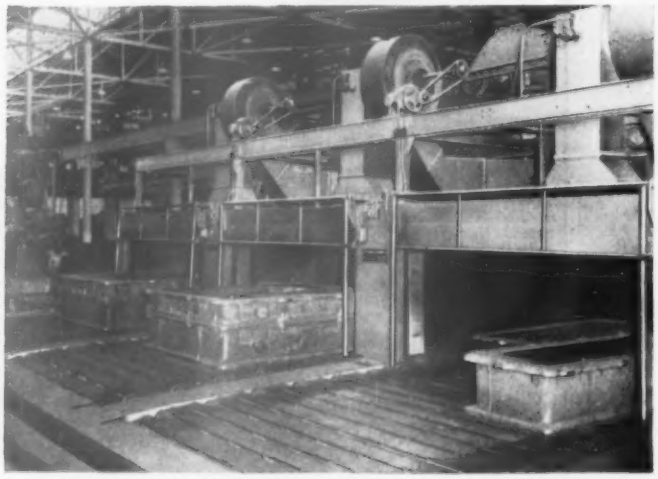

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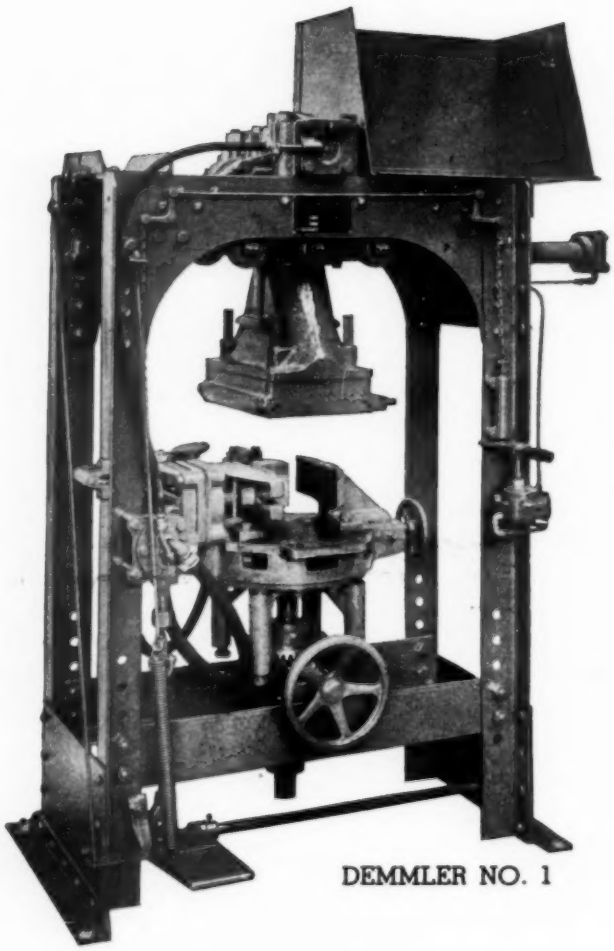

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(*Continued from page* 154)

little or no effect on the rate of graphitizing or on the nodule size. Reductions in annealing time for standard malleable of one-half are conceivable using 1 per cent copper and employing a preliminary treatment of 3 hours at around 600 degrees Fahr.

Another variation in practice which has shown possibilities is to bubble hydrogen through the iron before it is cast. When such irons are given a low temperature treatment malleablizing occurs at astonishing rates. Considerable refinement of the temper carbon structure is occasioned by the fact that irons treated with hydrogen are much more responsive to the pretreatment. Comparative tests on short-cycle malleable compositions containing 2.00-2.10 per cent carbon, 1.45-1.55 per cent silicon with and without a hydrogen treatment were used to show the marked increase in the rate of graphitization as a result of the low temperature pretreatment.

Specimens Graphitized Rapidly

Irons heated to 1790 degrees Fahr. in ½-hour revealed that the untreated specimens were not completely graphitized in the first stage after 15 minutes, while those given a low temperature pretreatment were graphitized completely within 5 minutes. When these irons were cooled through the temperature range of from 1450 to 1200 degrees Fahr., it was shown that iron, without hydrogen treatment, could be cooled at a rate of 300 degrees Fahr. per hour before any pearlite was retained if given the low temperature pretreatment. This compares with a cooling rate of 50 degrees Fahr. per hour for irons that did not receive the low temperature pretreatment. The response of the hydrogen-treated irons was even more revealing. A cooling rate of 900 degrees Fahr. per hour was necessary to retain pearlite in the hydrogen-treated iron given the low temperature pretreatment. Without the low temperature pretreatment, however, the hydrogen-treated iron showed no unusual response, pearlite being retained when the cooling rate exceeded 50 degrees Fahr. per hour.

One additional factor to mention, exerting a profound effect on the graphitizing rate of white cast iron, is the effect of quenching from above the critical temperature. Simmons recently investigated this factor with a view towards obtaining quantitative data correlating the severity of the quench with the size, shape, and rate of formation of the graphite resulting from the quench.

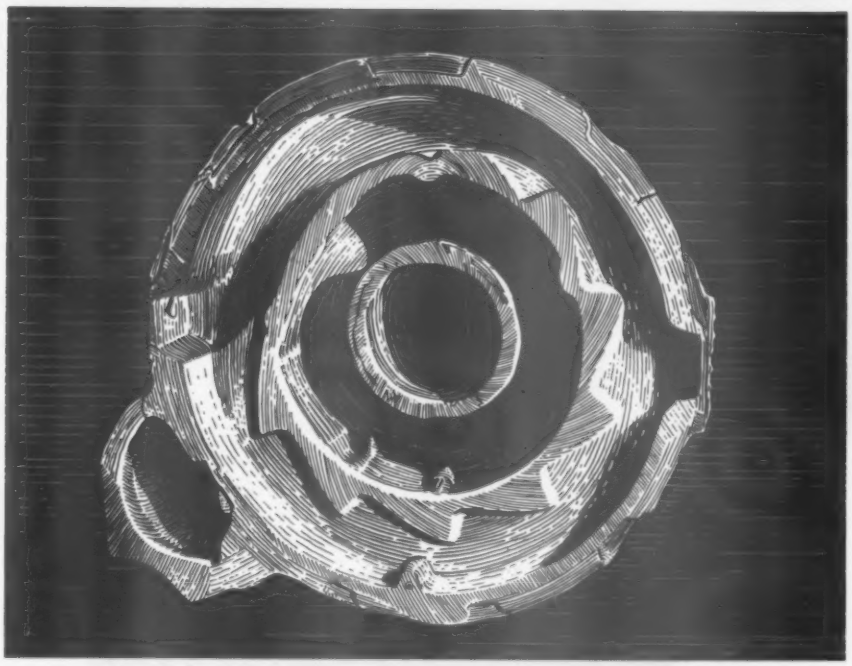
He used an iron with 2.50 per cent carbon, 1.30 per cent silicon, 0.45 per cent manganese, and 0.082 per cent phosphorus, and quenched specimens of the white iron after 10 minutes at 1635 degrees Fahr. in a stream of water at 75 degrees Fahr. The stream of water was directed against one ground end of a cylindrical specimen so as to obtain within the same piece a cooling rate gradient ranging from drastic cooling in water at

(*Concluded on page* 160)

AQUA-SET

A synthetic core binder

UNITED



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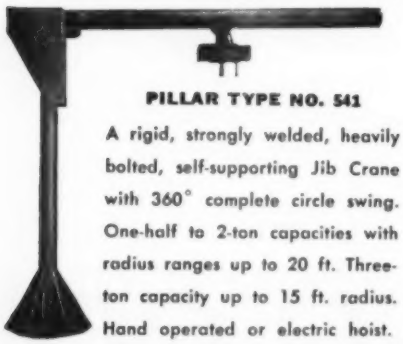

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(*Concluded from page* 158)

one end to cooling in still air at the other. The specimens were subsequently graphitized and examined carefully for alterations in graphite size. When the iron was prequenched at a rate of over 240 degrees Fahr. per second at 1300 degrees Fahr., subsequent annealing at 1680 degrees Fahr. gave very numerous and very fine graphite nodules outlining the interdendritic cementite areas. Slower quenching rates yielded progressively fewer and coarser graphite nodules on annealing. These results show that the graphitization reaction progresses at a greatly accelerated rate when the speed of quenching of the white iron is 240 degrees Fahr. per second or more at 1300 degrees Fahr., and that the graphitizing rate progressively decreases as the speed of quenching is lowered below that value.

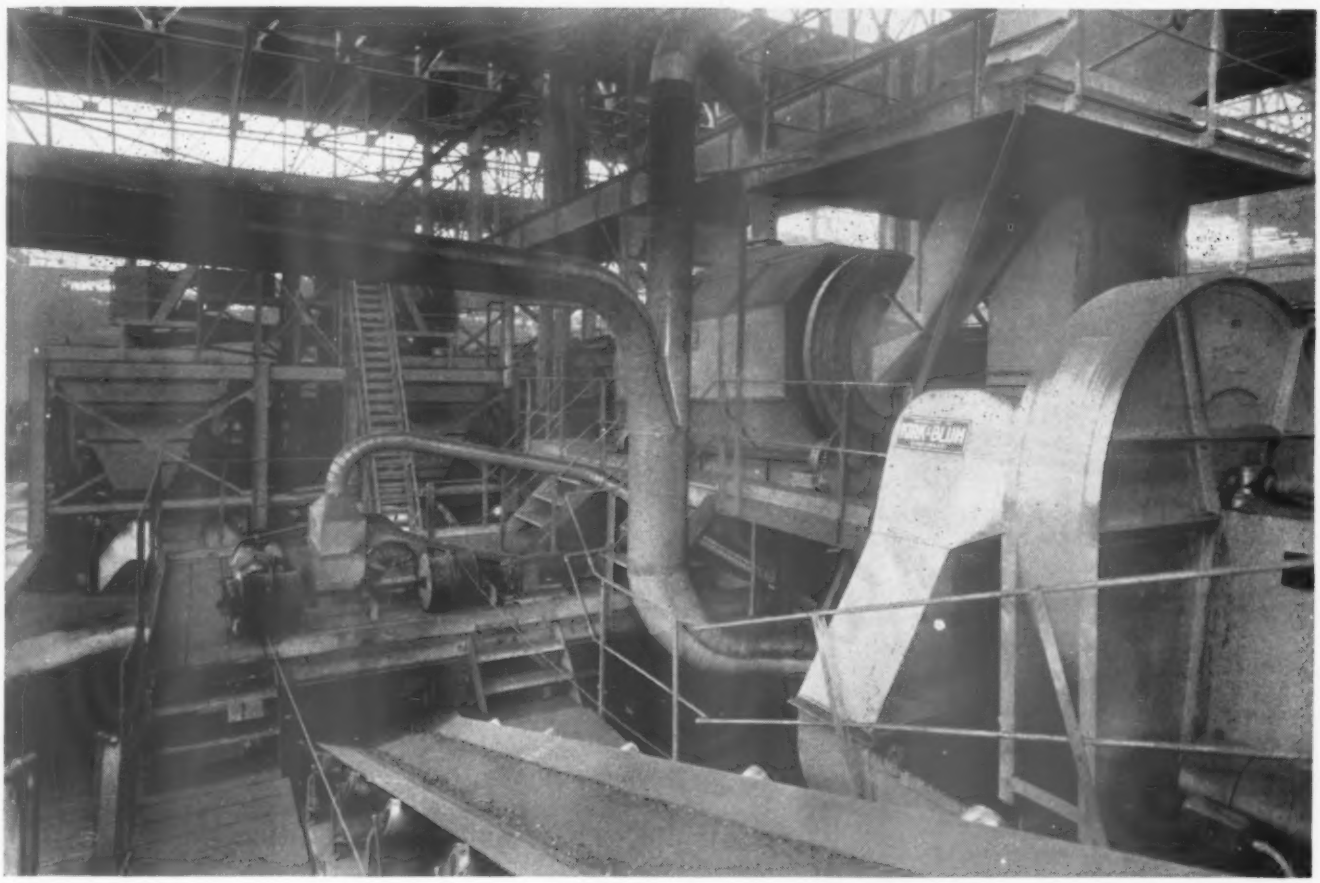
In reviewing the factors which have been found to affect the rate of graphitization of white cast iron, one quickly becomes aware that the problem of annealing malleable is related intimately to the various steps in the process of manufacture as well as to the raw materials used. The annealing process is by no means inflexible even when the composition of the iron and the graphitizing temperature in the first stage are held constant. Some of the factors which have been mentioned are still not wholly within our control. Some have academic interest but lack commercial application at this state of the art. Yet by contrast, the industry today, compared with what it was not so many years ago, has shown remarkable progress in applying such common knowledge to the reduction in annealing time. The production of short cycle malleable which is mounting rapidly, and the adaptation of new furnace equipment designed to speed up malleablization of standard grades of iron are examples of application of this knowledge.

Process Needs Skilled Supervision

Success in the manufacture of short-cycle malleable demands a degree of control and supervision somewhat beyond that which is common for the industry. This is because raw materials must be chosen to insure that large, coarse temper carbon spots will not form to prolong the anneal, especially during the second stage. Then the iron in the melting furnace must be superheated to a temperature and for a time long enough to militate against the possibility of having the iron mottle during casting.

Composition control becomes paramount because of the relatively high silicon content which such irons contain. Finally, annealing must be conducted under precise temperature-time cycles which include optimum heating and cooling rates and holding times at temperatures that do no more than assure that the irons will be completely malleablized. Controlled furnace atmospheres replace the annealing pots and packing material, and offer equally as effective protection against oxidation and have none of the additional bulk to require heating.

Three Types Of DUST CONTROL *Equipment*



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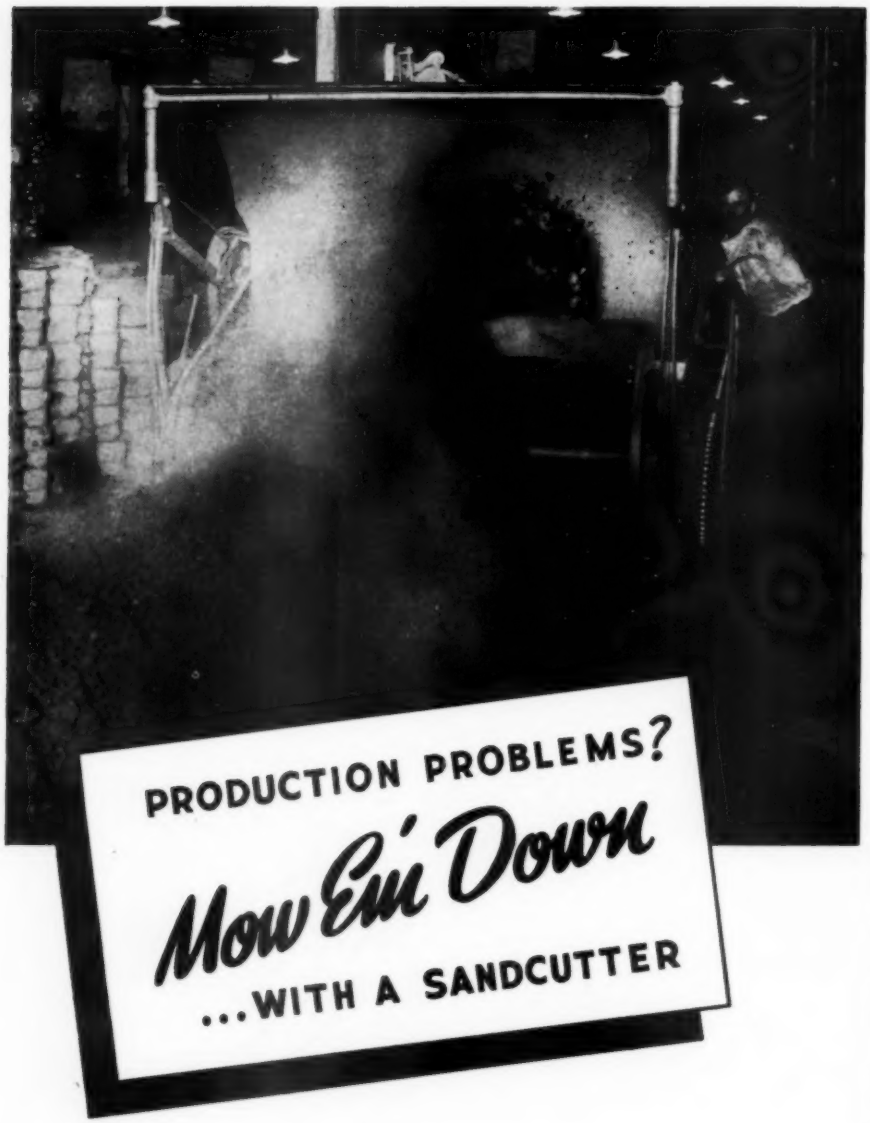
"COOLING SYSTEMS FOR THE GLASS INDUSTRY"
"DATA ON KIRK & BLUM PRODUCTION FACILITIES"

The **KIRK & BLUM** *Manufacturing Co.*

AN ORGANIZATION OF ENGINEERS AND MECHANICS

2808 SPRING GROVE AVE. **CINCINNATI, OHIO**



THE condition of sand cut with an American Sandcutter is unexcelled. It can be prepared in accordance with individual requirements for moisture, bond and permeability. It riddles fast, rams easily and vents perfectly.

The Sandcutter effects these definite production economies: •Eliminates drudgery and conserves manpower by eliminating shoveling. In shops where the molders themselves cut the sand, it enables them to devote full time and energy to production. •By thoroughly tempering the sand it largely overcomes common molding faults, such as drops, scabs and runouts. •Molders put up more molds per day. •Uniformity of sand makes uniform castings. •Lower discount losses result. •The finish of castings is smoother. •The sand cools rapidly in cutting—a great advantage in double-heat and continuous pouring shops.

An American Sandcutter will help you "mow down" your production problems. Write for more information today, or have one of our sales engineers call to investigate and solve your particular problem.

AMERICAN
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT STREET • MISHAWAKA, INDIANA

PRODUCING SILICON BRONZE CASTINGS

(*Continued from page* 63)

13.70 per cent zinc, remainder copper. These castings were made in green sand and poured at a temperature of 1950 degrees Fahr., oversize risers being provided to compensate for shrinkage. Results are satisfactory.

An interesting photograph of two Webbert test bars, similarly gated, and two wedge blocks (top and bottom gating) is shown in Fig. 18, together with an ingot. All of these were made of 46B28 silicon bronze, the sand cast specimens being poured in green sand, and the ingot poured in the customary chill mold. Comparative physical values at various temperatures appear in the accompanying table.

It will be apparent from the foregoing that the factors of importance in handling silicon bronze include the elements of shrinkage, control of melting and pouring temperature, to which may be added avoidance of contamination with other alloys. Owing to the diversity of melting equipment in foundries, some of them making silicon bronze castings for the first time, it is worthy of note that virtually all types of furnaces have been used with success, though the crucible type generally is preferred when available.

Use Open Flame Furnaces

Thus, despite the fact that silicon is readily oxidizable, the silicon bronzes are being melted and poured successfully in open flame furnaces. One foundry reports uniform success with this method over a period of 12 months, though certain precautions are observed. It has proved to be necessary to guard against overheating the metal and to avoid keeping the charge in the furnace for too long a time.

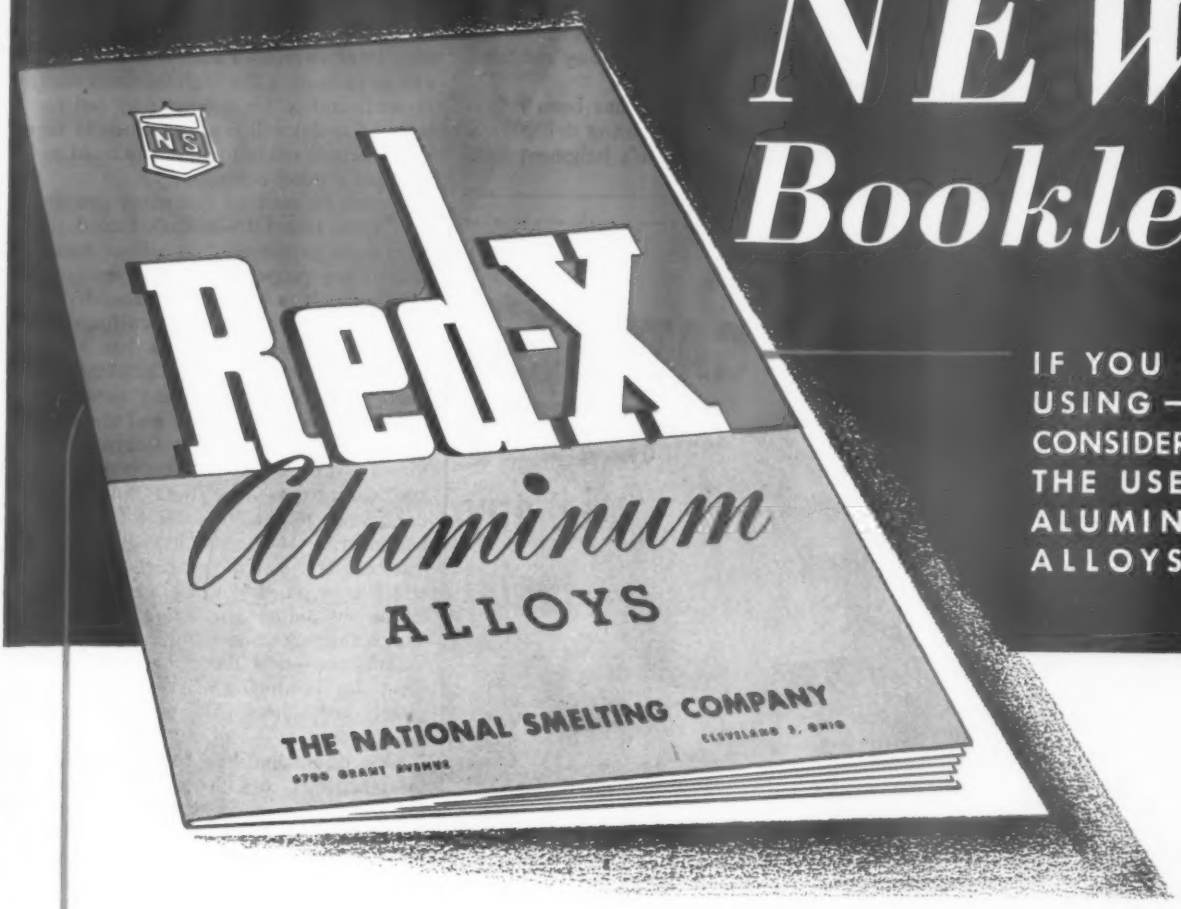
In this case, practice is to melt "by the clock," melting heats of 600 pounds in a maximum time of 35 minutes, using an open-flame, oil-fired furnace of the cylindrical type. Test bars from such melts are shown in Fig. 15. These are cast to size in green sand molds and pulled without machining. This type of bar has been in use for a year, and it proved entirely satisfactory, the alloying being 4.80 per cent silicon, 13.70 per cent zinc, remainder copper. Tests show 74,000 pounds per square inch tensile strength, 20 per cent elongation.

Originally in this case, it was the practice to melt with a glass cover. However, it was discovered that this retarded melting to such an extent that some heats were in the furnace for 2 or 3 hours. The practice was discarded in favor of a procedure involving no cover of any kind, though the temperature of the melt is never permitted to exceed 2000 degrees Fahr. Charges consist of 60 per cent back-

(*Concluded on page* 164)

WRITE FOR A COPY OF THIS

NEW Booklet



IF YOU ARE USING — OR CONSIDERING THE USE OF ALUMINUM ALLOYS . . .

Here in sixteen pages of pictures and specifications, with short and to-the-point copy, is the story of Red-X Aluminum Alloys. Developed by National over ten years ago and in use by some of the best-known foundries and manufacturers, and for special Army and Navy work, these alloys are attracting increasingly wide interest. If you are using or considering the use of aluminum alloys, be sure to write for a copy of this booklet . . . today.

THE *National* SMELTING CO.
6706 GRANT AVENUE • CLEVELAND 5, OHIO

(*Concluded from page* 162)

stock and 40 per cent ingot. Backstock, kept altogether free from contamination with other alloys, consists of gates, sprues, and trimmings. In view of the wholly satisfactory castings produced, this melting procedure may be regarded as evidence of the inherent stability of the alloy, even under conditions of open-flame melting, showing no trace of gassing or oxidation.

In this connection, and concerning the possibility of gassing the copper-zinc-silicon bronze alloys, field observations indicate they are no more susceptible to gassing than the tin bronzes or red brasses.

During the period of national emergency when the use of the silicon bronzes became actually less a matter of choice and more a matter of necessity, it was found at times that foundrymen had difficulty producing sound castings because of unfamiliarity with certain peculiarities involved. Notwithstanding ample caution against overheating, many practical foundrymen found it difficult to believe that sound castings could be poured at such low temperature—low, that is, when compared with the temperatures at which they had been pouring ordinary red brass mixtures.

In many instances it has been necessary to withhold the pouring deliberately against the foundryman's judgment until a point has been reached at which the foundryman actually insisted that nothing but mis-run castings would result. That highly successful castings did result often came as a matter of surprise to the foundryman.

To eliminate such conflicts of judgment (mostly visual), pyrometric control should be followed religiously. As a matter of fact, until long experience with the silicon bronzes has familiarized the foundryman's eye, the appearance of the metal at, say, 1900 degrees Fahr. will not strike him as indicating the high fluidities really present; and so his instinct may tell him that the metal will not run, when in fact it is precisely ready to enter the mold and produce a good casting.

It must be realized that many foundrymen have found themselves forced into immediate production on silicon bronze without any proper period of experimental handling. It is best for the foundryman to make some preliminary castings and observations for himself, as has always been found wise when undertaking production of castings from any new alloy, such as manganese bronze and aluminum bronze. In this way the foundryman may form his own practical concepts of shrinkage, size of gates and risers, fluidity, and the proper temperature for the work he has in view. He should likewise produce test bars of conventional pattern and obtain proper physical values before undertaking the actual production of castings. This is the procedure followed by all those foundrymen—and there are many—who are today producing a diversity of completely satisfactory castings made of silicon bronze.

Our discussion has been confined to sand castings, and the samples pictured for observation represent only a few of the applications for which the silicon bronzes are now being used. Foundrymen can contribute much to the war program by giving every consideration to the use of silicon bronzes as a substitute for copper-tin alloys. Tin will never be wholly off the critical list until the Allies win back the rich Dutch sources seized by the enemy early in the war.

CUT OFF

GATES and RISERS in any metal in far Less Time with

Tannewitz METAL CUTTING BAND SAWS

Variable Speed

Models to fit Every Need

In addition to our regular High Speed Band Saws delivering over 2 miles of smooth vibrationless saw travel per minute, which have proved so exceedingly popular in automotive and aviation work, the TANNEWITZ line now offers five other models to provide the fastest cutting medium for every foundry need: a 30" machine available in any 3:1 speed variation from 100:300 or 1000:3000 blade feet per minute—a similar machine with 3-step V-belt drive to give 2300, 3100, 4000 blade feet per minute—a 36" machine with 32" capacity under the guide—a model with 48" wheels and one with 52" wheels, operating at 3,000 blade feet per minute for handling extra large castings. Get a line on the TANNEWITZ metal cutting band saw that fits your particular needs. It will save time, step up production and repay its cost dozens of times. Write for full particulars NOW!

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

Foundry Equipment Data Revised

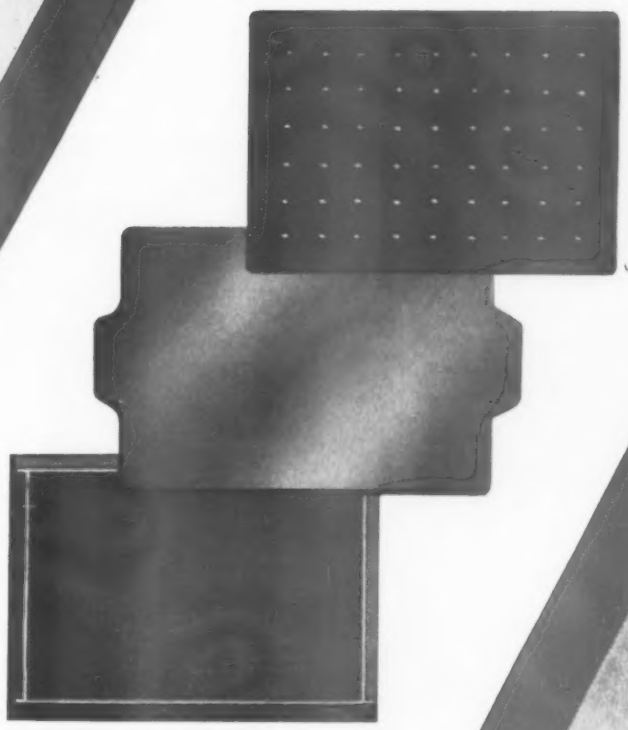
Revised figures on 1943 shipments of electric metal melting furnaces and of foundry equipment and supplies have been issued by WPB. Value of electric furnace shipments was $11,494,000, instead of $10,345,000, as reported in THE FOUNDRY for April. Foundry equipment and supplies shipments were valued at $52,656,000, instead of $53,806,000.

Opens New Office

Cutler-Hammer Inc., Milwaukee, has established a new sales office at 30 East Broad street, Columbus 15, O. with Russell D. Yoder as sales engineer in charge. Mr. Yoder formerly was located at the Cincinnati district office.

FLAWLESS CASTINGS

WITH MOLTRUP FLATTENED STEEL PLATES



The finest equipment obtainable is necessary to guarantee perfect products in the foundry. Moltrup steel pattern, core and bottom plates fit into this picture—you can buy nothing better. They are especially processed to stand high oven temperatures, are uniform in thickness, perfectly flat and will not warp, buckle or distort in any way.

MOLTRUP

MOLTRUP STEEL PRODUCTS COMPANY · BEAVER FALLS, PA.
(PITTSBURGH DISTRICT)

COMPETITIVE POSITION OF GRAY IRON

(*Continued on page* 168)

less. No matter how much or how little we know about gray iron, we cannot assume that what information we do have is essentially correct, for there is much misinformation on the subject, and the consuming industry is likely to have very limited knowledge, only part of which is correct.

One of my friends, who should rate the title of "Number One Salesman of Gray Iron Castings", says it takes him from 3 months to 3 years to burrow into the problems of his potential consumer. Starting with a new organization he contacts the buyer and seeks permission to see the chief inspector, machine shop superintendent, design engineer and others who have to do with engineering materials, and he keeps burrowing in that organization until he gets to the bottom. Then he starts back up again and when he gets back to the buyer he knows all about the manufacturing, inspection and service requirements that his gray iron castings will have to satisfy if he is going to change a potential consumer into an actual consumer.

If any sizable group of gray iron foundries were to assemble all of the sales literature they had issued in the last 10 years, it is probable that the sum total would be regarded as rather picayune—if we are agreed that the foundries are the only source of information on gray iron for the consuming industry. The future of the gray iron industry will be proportional to the time and effort that producers are willing to spend on becoming informed completely on the material, to the time and effort we spend in becoming acquainted with the consumer's needs and what we will do in disseminating sound information on our product. An expression heard many times during the course of this war is "know-how." "Know-how" in the gray iron casting business means that you know how to produce a quality product—not irrespective of cost but most economically; that you have a sound cost accounting system, and knowing actual cost, your selling price anticipates making a profit; that you know the type of work your facilities are best adapted to produce; that your technical control is sufficient for the product you make, and that you actually are working at the job of selling.

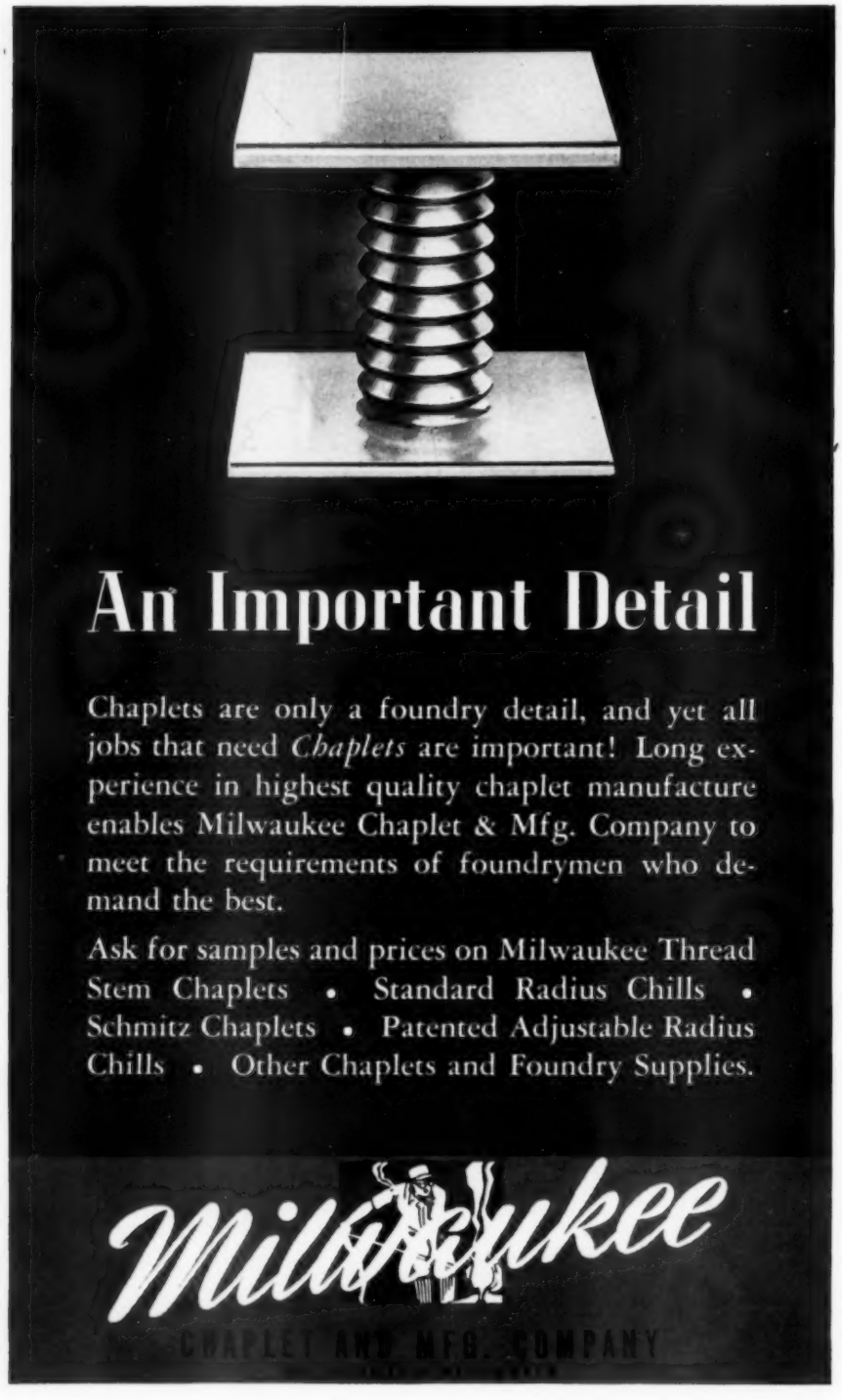
May Have Huge Surplus

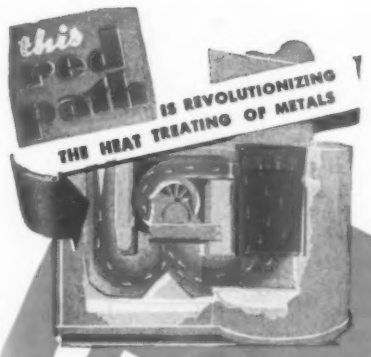
At the end of World War I we had some 5 or 6 billion dollars of surplus goods on hand, and the estimates of surplus goods likely to be on hand at the end of this war vary widely up to $75 billions. In the early stages of this war this great industrial nation bowed its head in shame time and again when it heard the statement "too little too late". We have been at war almost 27 months, and now that our production machine is geared to global war it is highly improbable that we can serve as the arsenal of democracy and avoid huge material surpluses at the war's end. If these surpluses are not released with the wisdom of King Solomon, they will be the most potent force you have to face in the postwar period. Should these surpluses become a political football, anything can happen.

Undoubtedly you have given some thought to competition from the light metals and plastics in the postwar period. These materials will be part of the surpluses just referred to, and if they are dumped on the market, competition will be chaotic.

Just prior to the war we produced about 10,000,000 pounds of magnesium per year. We now have facilities to produce 500,000,000 pounds per year, or about 50 times prewar production. The current market price of magnesium is 20½ cents per pound. Much of current production costs more than 20½ cents per pound to produce. The Canadian government's Dominion Magnesium Co. Ltd., which has had relatively long experience with magnesium production by the Pidgeon ferrosilicon process, pub-

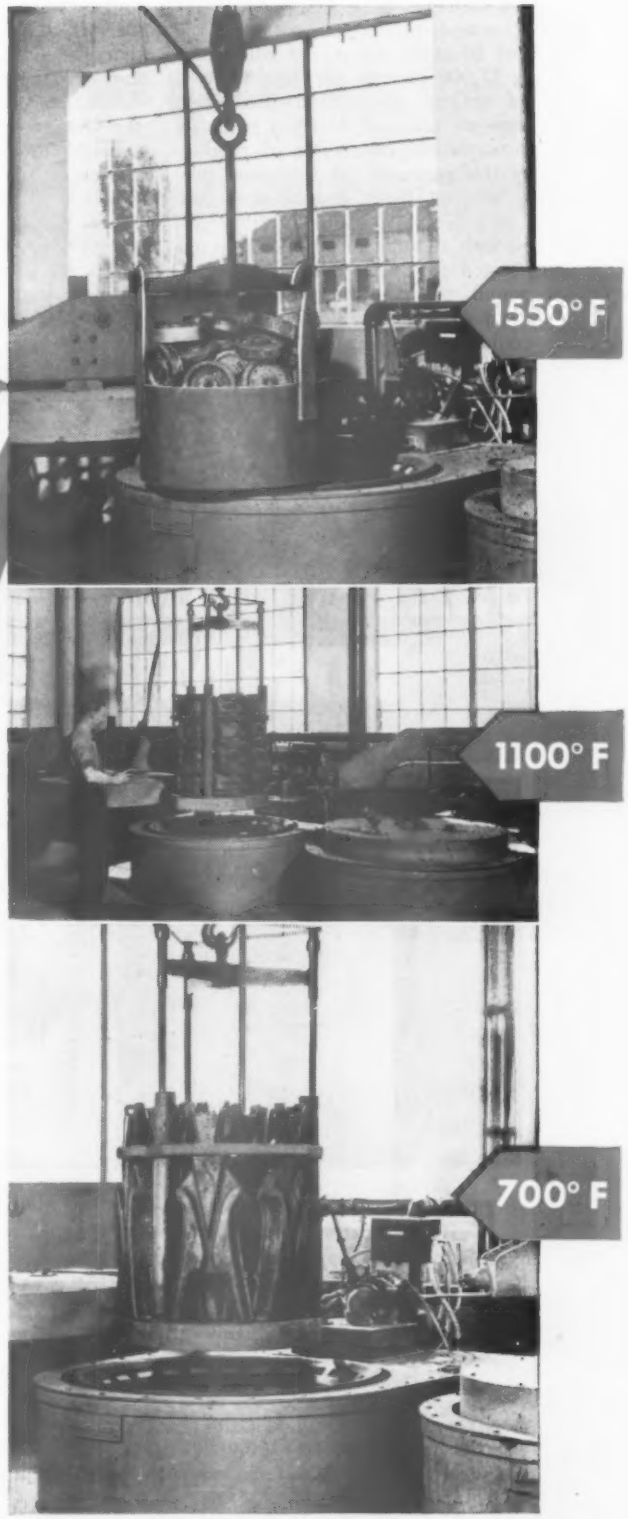
(*Continued on page* 168)


An Important Detail
Chaplets are only a foundry detail, and yet all jobs that need *Chaplets* are important! Long experience in highest quality chaplet manufacture enables Milwaukee Chaplet & Mfg. Company to meet the requirements of foundrymen who demand the best.
Ask for samples and prices on Milwaukee Thread Stem Chaplets • Standard Radius Chills • Schmitz Chaplets • Patented Adjustable Radius Chills • Other Chaplets and Foundry Supplies.
Milwaukee
CHAPLET AND MFG. COMPANY



Versatile!

The Lindberg Super-Cyclone Furnace



For all metal treating, utilizing heats from 300° to 1750° F., the Lindberg Super-Cyclone Furnace gives complete versatility.

For instance, in the photographs here, a charge of gear blanks is just going into the Super-Cyclone at 1550° F. Next a load of gate valve weldments is being charged for stress relieving at 1100° F., and below, 16 railroad frogs are lowered into a temperature of 700°F. for tempering. All using the same Super-Cyclone Furnace!

When a load must be reheated at a lower temperature, after quenching, the Super-Cyclone can be accurately brought down to the proper heat while the load is in the quench, saving precious time and rehandling.

The Super-Cyclone operates on a principle of fan driven hot air from an isolated heating chamber racing at high velocity through the most compact load to build up temperature with rapid uniformity. This allows temperatures to be built up or reduced with amazing speed. And there is a complete avoidance of radiant heat that causes distortion.

This revolutionary heating principle saves time and space, keeps work straighter and cuts production costs. Write for complete information to Lindberg Engineering Company, 2453 W. Hubbard St., Chicago 12.

ARMY E NAVY

LINDBERG FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

(*Continued from page* 166)

lishes current production costs of the order of 40 cents per pound when producing 17,000 pounds per day. This is one of several magnesium production processes we use, and 40 cents probably approximates our own costs of producing by this process. At least one producer, who employs several processes, after considerable experience but still dogged with all kinds of production problems, stated that their costs were $1.40 per pound. It is quite possible, however, that some of the processes now in use could produce 100 to 200 million pounds of magnesium annually and show a profit at 20½ cents a pound.

Current markets for magnesium are in aircraft, and military uses such as incendiary bombs. In the January, 1944, issue of THE FOUNDRY, D. Basch, consultant on materials and processes for the General Electric Co., stated that the average cost per pound for aircraft quality magnesium castings is $2.55. In the February, 1944, issue of THE FOUNDRY, A. H. Allen, Detroit editor, referred to a supercharger housing casting that cost $5.08 per pound. Although these references concern aircraft quality costs—usually higher cost applications due to more stringent inspection requirements—there is evidence of the price the consumer has to pay. Magnesium castings have to be risered extensively and the normal yield is close to 20 per cent.

Just prior to the war, aluminum production was close to 300,000,000 pounds annually. Current facilities could produce about 2,300,000,000 pounds annually but actual production in 1944 will be considerably below this level. Expansion in the aluminum industry was approximately 7½ times prewar production levels. The current price of aluminum is 15 cents a pound, but we may assume that some of our current production is above the 15-cent cost level. Aluminum's current market is the aircraft industry. About 475,000,000 pounds of aluminum castings were produced in 1943. Mr. Basch says that aircraft quality aluminum castings cost his company $1.75 per pound.

We are currently producing about 660,000,000 pounds of plastics a year. I do not know how this compares with prewar production but possibly it represents an industry expansion of something like 15 fold. Some low-grade raw materials used in making plastics cost as little as 12½ cents per pound, but the better quality materials sell for 20 cents a pound and higher. Generally, the prices of finished plastic articles are in dollars per pound.

Compare Steel With Plastics

In the Jan. 31, 1944 issue of *Steel*, Guy Hubbard, machine tool editor, reporting on the annual meeting of the Society of Automotive Engineers, referred to talks made by Edgar C. De Smet, executive engineer, Willys-Overland Inc., Toledo, and L. W. Kempf, Aluminum Co. of America, Cleveland. As Mr. De Smet is known for his close association with such radical developments as the famous Army jeep, the following from the report on his talk is pertinent: "Great as the temptation may be to build dream cars, manufacturers will have to face realities of the practical, economical utilization of familiar materials, including steel, aluminum and glass." In his comparison of steel with aluminum, Mr. De Smet dealt primarily with fabrication of automobile bodies: "As a basic material, we find that the cost of any suitable aluminum alloy is much higher than body steel. Present sheet prices call for an average of 30 cents per pound for aluminum, against 3 cents per pound for steel—or about ten to one. Considering an approximate saving in weight of one pound for each pound of aluminum used, when comparing parts of equal strength, we still have an unfavorable cost rate of five to one for a given fabricated assembly."

Mr. Kempf pointed out that the automotive industry had found it economical to use considerable aluminum for pistons even though primary aluminum cost 20 cents per pound. After the last war when the price of secondary aluminum dropped to 7 or 8 cents a pound, considerable aluminum was used for cylinder heads and intake manifolds, up to 35 pounds of aluminum per car on a small

(*Continued on page* 172)

USERS COME BACK FOR MORE!

8 OUT OF 10 TRANSITE CORE PLATE USERS ARE REPEAT CUSTOMERS!

IT'S EASY to figure out why—once they give Johns-Manville's Transite Core Plates a try—foundries keep coming back for more. Here are the answers:

Light Weight: Transite Core Plates light weight means easier handling, increased production.

Less Breakage: Their fibrous nature provides unusual shock resistance, minimizes breaking and cracking.

Easily Cleaned: Transite Core Plates are actually self-cleaning when both sides are used alternately.

Economical: These J-M plates combine low initial price, low handling costs and long life.

Low Warpage: Maximum warpage on plates under 24" is 1/64" on either dimension. On plates over 24" warpage will not exceed 1/64" in 24" length and width.

Corrosion-Resistant: These Transite plates are made of an asbestos and cement combination. They cannot corrode.

Non-Metallic: No critical materials used.

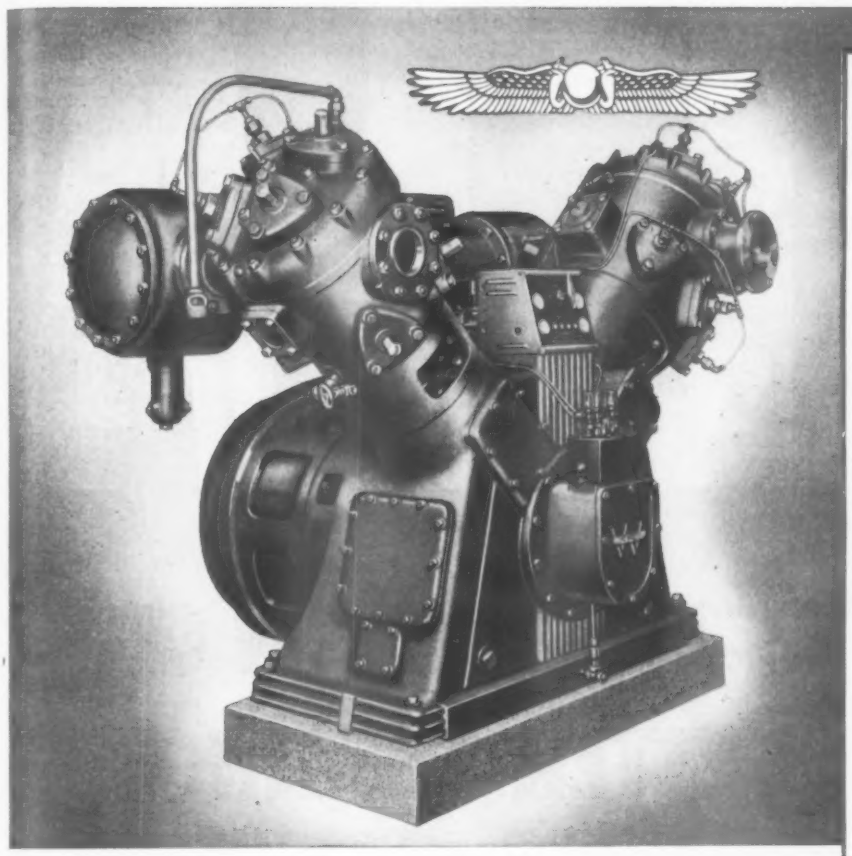
For full details, write for Brochure PP-10A. Johns-Manville, 22 East 40th Street, New York 16, New York.

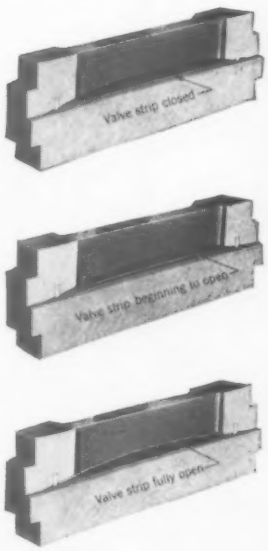
JM PRODUCTS

Johns-Manville

TRANSITE Core Plates

NEW WORTHINGTON HUSKIE PACKAGED COMPRESSORS





The simplest, lightest, most efficient compressor valve ever made. A thin strip of steel seats by increasing contact from each end to the center. No springs, buffer plates or cushioning devices. Fits accurately even when valve seat is warped, and patented end inserts prevent pinching.

For Cooler Running . . . Trouble-Free Operation

Here's a lot of long-lived power, from 400 to 1350 cu. ft. per minute displacement, in a new streamlined "package" specially designed for trouble-free operation, low installation and maintenance costs.

In both 3 and 5-step models, variable capacity control results in the *cooler operation* of Worthington's new Y Angle Type Huskie Compressors. Cylinders are open to cool suction air at most stages of unloading.

Other Worthington "Outperformance" features include Feather Valves*— forced feed lubrication — filters for uninterrupted oil filtration, non-stop filter-cleaning. Write for more details. Describe your application.

WORTHINGTON PUMP AND MACHINERY CORPORATION
HARRISON, N. J.

WORTH BEHIND THE NAME WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON HUSKIE

Y Type . . . Horizontal . . . Vertical . . . Radial . . . Portable . . . Gas Engine Compressors . . . Vacuum Pumps

*Reg. U. S. Pat. Off.

AC4-4

DELTA

FOR *faster* PRODUCTION OF SMOOTHER, BETTER CASTINGS

DELTA CORE & MOLD WASHES CUT CLEANING ROOM COSTS

For STEEL—For GREY IRON AND MALLEABLE
For NON-FERROUS METALS

All DELTA Core and Mold Washes are Dilatometer proven for hot strength to insure positive adherence to core and mold surfaces. They produce high-fusion, highly-refractory surfaces which are absolutely moisture-proof. They eliminate gas formation and are non-reactive in contact with molten metals.

DELTA MUDDING COMPOUNDS

For mudding joints and patching cores for various metal castings. Non-reactive with molten metals... waterproof... will not crack, peel nor flake. Seal joints perfectly preventing gas leakage from core and producing smooth castings at joint areas.

DELTA PARTEX—Nut Shell Parting

The modern, scientific Lycopodium replacement... more economical and most efficient. Absolutely safe and non-hazardous to use.

DELTA NO-VEIN COMPOUND

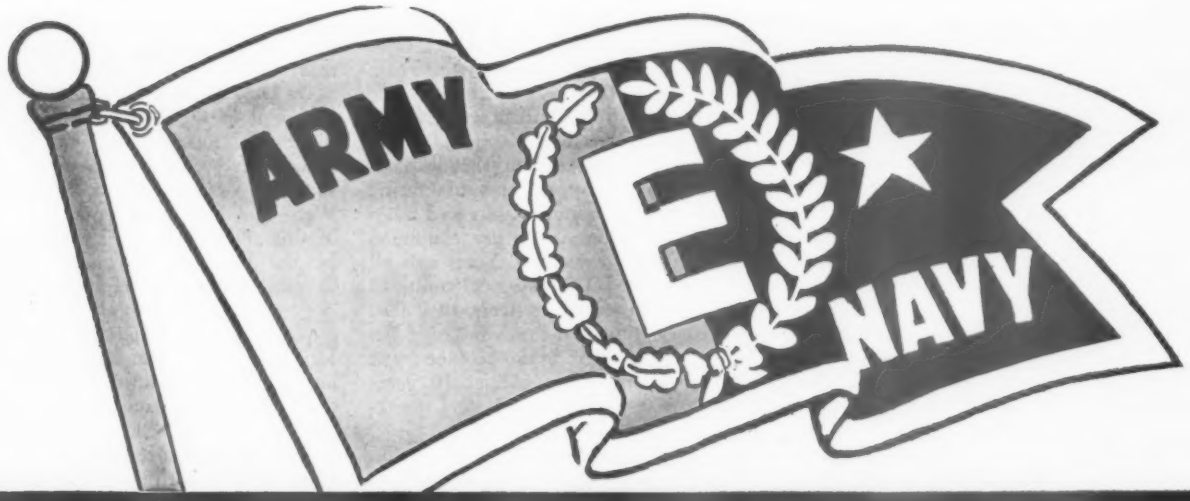
A combination of oxides specially compounded with other chemicals... use to eliminate veining and penetration and produce smooth, clean casting surfaces.

DELTA SPRAY BINDERS

For green sand molds. Produce almost instantaneously dry mold surfaces eliminating hours of oven or torch drying. Easy and economical to use.

DELTA CORE OILS

Compounded to meet the most exacting requirements in all phases of foundry core work. Laboratory standardized and checked for high tensile strength—low gas and fast baking.



FOUNDRY PRODUCTS

To better, more scientifically serve the foundry industry the entire DELTA laboratory is devoted exclusively to research in foundry problems and to the development of new and improved DELTA products for foundry use.

A VIEW OF THE DELTA FOUNDRY RESEARCH LABORATORY

1. Showing Complete Core Testing and Tensile Machines.
2. Sintering Machine
3. Dilatometer
4. Baking Oven
5. Sand Muller
6. Plus all other physical and chemical testing equipment necessary to maintain the most rigid standards of uniformity in quality and result-producing efficiency.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF
INDUSTRIAL AND AUTOMOTIVE OILS, GREASES AND COMPOUNDS
MILWAUKEE 9, WISCONSIN

(*Continued from page* 168)
portion of the cars manufactured. When the price of secondary aluminum rose and approached that of primary aluminum, the trend toward the use of aluminum in automotive construction declined. He feels that with secondary aluminum available at 8 cents per pound there is a probability of utilizing up to 35 pounds of aluminum per car. He said further that if the price of secondary aluminum approached 5 cents per pound it would be equivalent to iron at 1¾ cents.

When Mr. Kempf speaks of iron at 1¾ cents per pound, that refers to the iron foundry's raw material cost of $35 per ton. Should the price of secondary aluminum approach 5 cents per pound, it is most likely that the iron foundry's raw material cost will be closer to ¾ of a cent per pound than to 1¾ cents.

Use of gray iron for component parts of automobiles has been increasing over the years, and just before the automotive industry stopped manufacturing pleasure cars to produce tanks and other war material, the average car contained 500 pounds of gray iron. Years ago all automobiles used a forged steel camshaft —today all automobiles have cast iron camshafts. Before the advent of four-wheel brakes the braking face was switched to gray iron. About 10 years ago Ford changed to a cast steel crankshaft from a forging. It is highly probable that the future automotive crankshaft will be high strength gray iron.

On Oct. 7, 1943, George A. Kelly, vice president of the Pullman Co., addressed the Steam Railroad Section of the National Safety Congress in Chicago, using as the title of his address, "Performing in War—and Preparing for Peace". Copies of this address were distributed recently by the Pullman Co. and I would like to quote a few paragraphs from page 13: "In respect to new construction techniques and new materials, nothing revolutionary is as yet in sight. Car weight, insofar as the car structure itself is concerned, seems to have reached just about the lowest point consistent with thoroughly safe construction. And, from Pullman's point of view, with the Pullman car noted as one of the safest places in the world for a human being to be, safety of passengers is a vital competitive factor in our favor —and we intend to keep it so.

"There will be some weight reduction, of course, as the result of improvements in the car accessories—such as lighter, smaller and more efficient generators and air conditioning equipment. Employment of plastics and lighter metals in fittings may aid in further lightening of the cars. As to size, the exterior dimensions of the cars are limited by railroad requirements and existing physical conditions, such as track curvatures and bridge clearances, and little change is likely in this direction.

Consider Strength-Weight Ratio

"The research staff is continuing its work on improvements in car safety and comfort, and in co-operation with the railroad equipment industry as a whole promises significant developments in car suspension and braking systems."

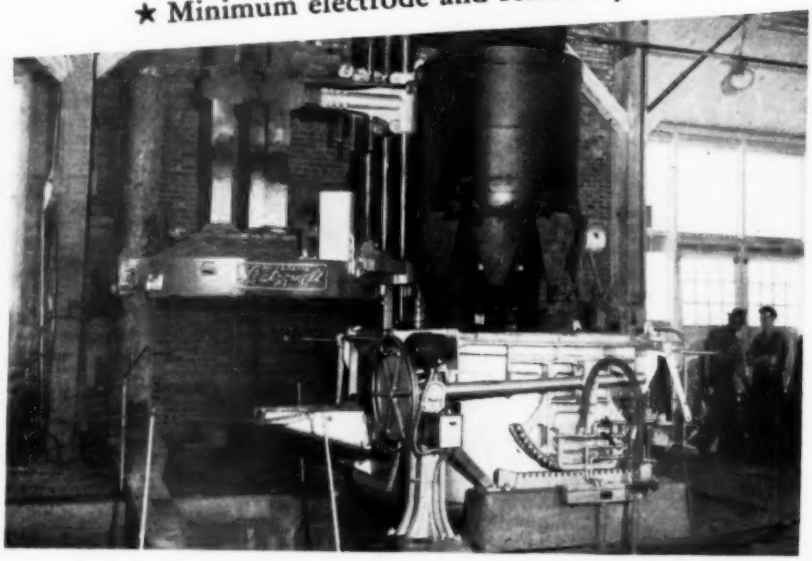
Let us consider a property that is receiving increasing attention in current advertising, particularly when comparisons are made between light metals and plastics, and the iron and steel alloys. This is the *strength-weight* ratio. It is not uncommon to visit a gray iron foundry and find the responsible executive of that foundry griping because the consumer's specification requested a quality considerably better than what the former considered necessary. We may assume that neither the consumer nor producer is completely informed on the minimum properties required for service requirements, but of producer and consumer it is most probable that the consumer is best informed. When materials are tabulated to illustrate the *strength-weight* ratio, gray iron generally is at the bottom of the list. But I do not discredit the people who make these compilations for I honestly believe they do the best job possible with the data they have at their disposal.

When we gripe about the unnecessarily high requirements some consumer demands of our products, are we not unconsciously resisting scientific progress, and is not one of the results of this resistance the position of gray iron at the bottom of the list when materials are

(*Continued on page* 174)

MOORE RAPID
Lectromelt FURNACES

★ Increased tonnage per man hour
★ Lower power consumption
★ Minimum electrode and refractory costs



★ Lectromelt furnaces of the top charge type afford greater steel production through simplified and economical operation. Top charging has the advantage of continuity of operation by lessening the time between heats, thus conserving the furnace heat from the previous melt.

Sizes range from 250 pounds up to 100 tons capacity. Let us forward you detailed information.

PITTSBURGH LECTROMELT FURNACE CORPORATION
PITTSBURGH, PENNSYLVANIA

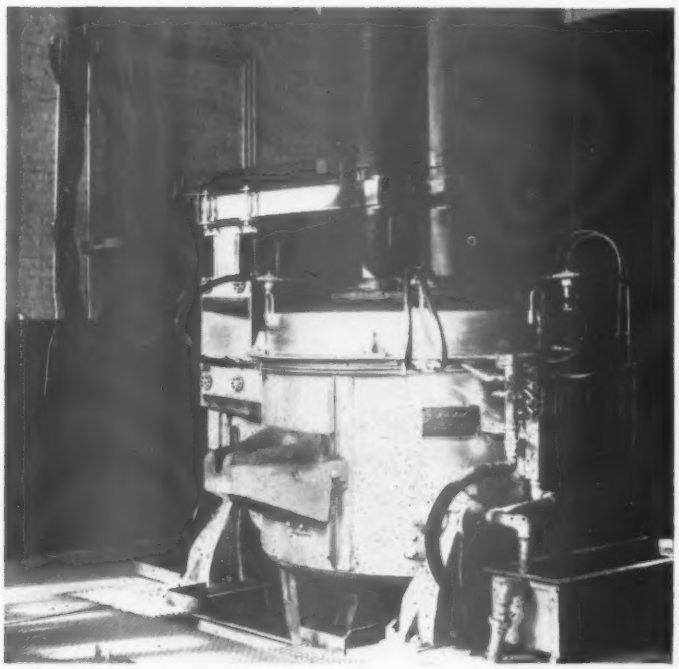
IRONTON CARO-LINE

A Monolithic Lining for

ACID ELECTRIC FURNACES

•

LADLE LININGS IN ALL SIZES



"Ironton Caro-Line" siliceous ramming refractory is being used as a rammed in bottom for acid electric furnaces in some of the most modern iron and steel foundries in this country and Canada. It is usually mixed with 40% ganister of the proper grain size, then rammed in solidly with an air hammer. It is no longer necessary to take the time and use electric energy in making sintered bottoms. It is more easily installed and lasts longer than ganister-clay mixtures.

"Ironton Caro-Line" is also giving outstanding service in ladles handling steel, alloy iron, malleable iron and gray iron. Its high refractoriness and great resistance to slagging reduces the loss of castings due to slag inclusions.

Ask us for additional information on this unusual refractory material.

Address Box 209

THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

(*Continued from page* 172)

compared on a *strength-weight* ratio?

You may recall that Henry Ford stated some years ago that successful industries of the future would be those who learned how to salvage the waste materials of American industry. The foundryman who knows more about converting waste materials into usable products will have a distinct advantage over the foundryman whose attainment is achieved irrespective of cost. Most of us utilize the cupola type of furnace, and this furnace is outstanding in its ability to convert the lower grades of waste materials into high quality products. Steel turnings and malleable iron and gray iron borings are representative of industry's lowest grade waste materials. For some years I have encouraged foundrymen to learn how to utilize these materials, with the warning that they should try to get turnings from dependable sources.

One plant at present is melting 300 tons a day with a cupola in which 65 per cent of the charge is loose steel turnings. The end product of this operation is alloy steel ingots. The combination of the steelmaking process and use of the lowest grades of industry's waste materials offered this company an opportunity to produce at a startlingly low cost.

Earlier in this discussion it was stated that progress in one portion of the foundry industry would be proportional to the over-all progress in the whole foundry industry. Now the question is: "Has the foundry industry gone forward or backward in this war?" In the 6 years 1935 through 1940, steel foundries produced some 600,000 to 650,000 tons of castings per year though they considered a normally good business year to be 800,000 tons or better. In 1943, steel foundries produced nearly 2,750,000 tons of castings, or somewhat more than four times the 1935-1940 average. The 1944 tonnage is expected to be about the same as in 1943 but the weight per casting is going down so the number of castings will be up. There were about 250 steel foundries before the war and now there are about 350.

During the six years 1935-1940, output of malleable iron foundries averaged between 450,000 and 500,000 tons of castings per year. During the early stages of this war, the normal peacetime markets for malleable, namely the automotive, railroad and agricultural industries, almost disappeared and malleable was not used as a substitute for more strategic materials. The production of malleable in 1942 was considerably less than in 1941. In the early part of 1943, the use of malleable as a substitute for unavailable brass and bronze was a major development. There was an appreciable use of malleable for machine gun parts, bomb and shell lifting lugs and other ordnance uses previously utilizing steel forgings.

Use More Malleable

Lately the increasing need for Army trucks, railroad equipment and agricultural equipment has thrown a heavy load on the malleable industry for products that closely parallel its normal peacetime product. During 1943, the industry produced about 850,000 tons of castings, the biggest month being December, and closed the year with a backlog of 445,000 tons. There are about 110 malleable foundries in this country. Two new malleable foundries now being built represent the total new additions to the list, although there has been considerable extension of facilities in some of the other foundries. The current expansion represents an investment of the order of $15,000,000 and amounts to some 150,000 tons increase in malleable facilities. It has only been within the past 3 months that the malleable castings industry started to go to town. If the military does not seriously cut its programs involving malleable castings, it is probable that 1944 production will be somewhat in excess of 1,000,000 tons.

There has been a trend in the malleable industry away from batch melting and toward duplex melting. Recently this trend has been accelerated greatly and it may be estimated that something like 90 per cent of this year's production will be by the duplexing process.

Figures on production of gray iron castings are rather inexact. It might be said that at least 11,000,000 tons were

(*Concluded on page* 176)

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SCHUNDLER BENTONITE, Fesco Fire Clay, Fesco Bond and other foundry products are sold with a technical service fitted to your requirements . . . a service provided by a large, scientific staff working in a well equipped laboratory.

24 HOUR SERVICE to most Foundry Centers . . .

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Kansas City, Mo. . Barada & Page, Inc.
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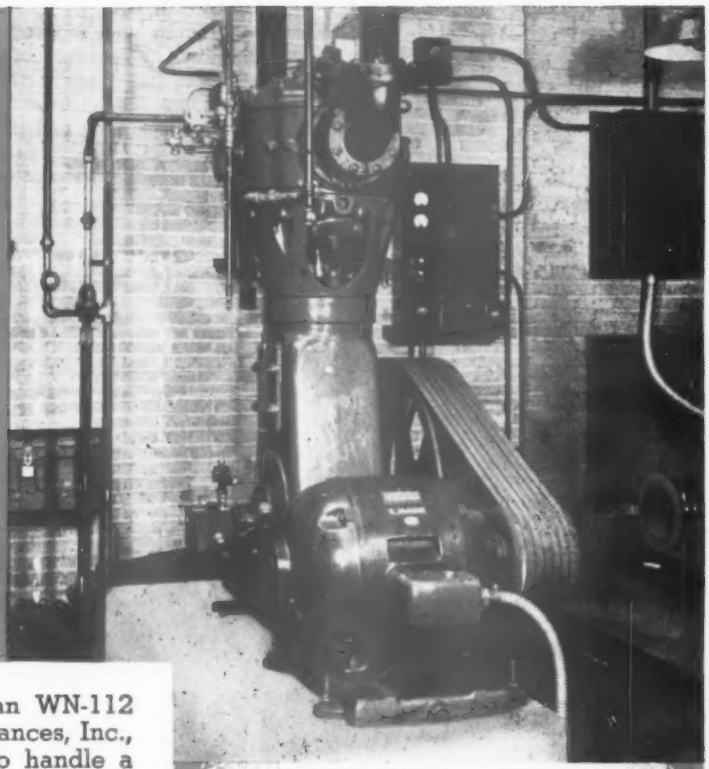
F. E. SCHUNDLER & CO., INC.
520 RAILROAD STREET
JOLIET, ILLINOIS

Schundler

Long-Life Trouble-Free Sullivan WG-9 Compressor

BOUGHT BY BENDIX

Home Appliances, Inc.



Sullivan WG-9 Compressor for 24 hour a day service. 11 sizes. Capacities 153 to 822 CFM, pressures 30 to 150 lbs.

Following up the purchase of a Sullivan WN-112 compressor in 1937, Bendix Home Appliances, Inc., bought a Sullivan WG-9 Compressor to handle a sandblast load. The plant engineer has this to say: "We won't worry about it if it is built like the WN-112." (That's the point; it is.) "That WN-112 has been running 24 hours a day for the last 7 months; and, except for a man checking the oil regularly, you'd never know it was in the plant."

The WG-9 single-stage double-acting compressor for smaller-demand, heavy-duty service *is* built like the famous Sullivan WN-112. That is to say, every part is built from the best material available *for that purpose,* and is not a compromise. The mirror-honed cylinder and crosshead liners are replaceable *in your plant by your men* and bring back new compressor efficiency after tremendous service. The vital elements such as air passages, valve assemblies, counterweights, etc., are painstakingly engineered by a company noted for the sincerity of its design work. Full force feed lubrication, long-life anti-friction bearings, and maximum capacity per foot of floor space are other reasons why this Sullivan compressor also has established enviable performance records. Don't buy; just INVESTIGATE—thoroughly. SULLIVAN MACHINERY CO., Michigan City, Ind. *In Canada:* Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

OFFICES:

Seattle	Portland	San Francisco	Los Angeles	Salt Lake City
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New York	St. Louis	Knoxville	El Paso	Denver
Chicago	Detroit	Huntington	Butte	Dallas

4 THINGS TO MAKE SURE OF WHEN YOU BUY AN AIR COMPRESSOR

1. *Are working parts made of longest-life material available . . . and not a compromise?* Note for example, the generous size WG-9 crossheads tin plated and running in mirror-finish honed liners of tough alloy steel almost obviating wear.
2. *After long service, can working parts be easily replaced to bring back "New Machine Efficiency"?* WG-9 special alloy steel liners can be thus renewed.
3. Are soundest basic engineering concepts followed? How do the valves operate? What about air passages? What is the *truth* about flywheel and pulley wheel combined?
4. Is overall design simple, accessible, yet built to eliminate the usual compressor readjustments? Sullivan users agree that Sullivan Compressors never need break-in adjustments and give least trouble of any.

SULLIVAN AIR COMPRESSORS

STATIONARY AND PORTABLE AIR COMPRESSORS FROM ¼ TO 3000 H. P., PNEUMATIC CASTING GRIPS, FOUNDATION BREAKERS, PORTABLE HOISTS, ROCK DRILLS

(*Concluded from page* 174)
produced in 1941, 9,400,000 tons in 1942 and 9,300,000 tons in 1943, but estimates made from the industry's production reports to WPB for 1942 were as much as 14,500,000 tons for that year. This is a large tonnage, particularly when one remembers that a great deal of the automotive, soil pipe, pressure pipe, sanitary production and miscellaneous uses—such as in refrigerator compressors, electric irons and similar civilian items—has been curtailed greatly.

The steel industry produced nearly 89,000,000 tons of steel ingots during 1943. When we think of tonnages produced in our various industries, we are likely to compare the foundry industry with the steel industry as a David and Goliath. Actually, there is an "ingot ton" and a "casting ton" and an "end-use ton", and they are different.

When a steel mill produces an "ingot ton" it drops the ingot and ships something like 65 per cent or less of that ton to its customer. If that customer happens to be forge shop it does further processing before its end product—a forging—goes to the machine shop, and the end-use tonnage out of the machine shop averages less than 40 per cent of the steel mill's "ingot ton" and on occasion is as little as 10 per cent of the "ingot ton". What the foundry ships as "casting tons" much more closely approximates "end-use tons".

In one gray iron foundry whose sole product is crankshafts, the crankshafts are molded and poured horizontally but immediately after pouring they are placed in a vertical position. This latter operation requires crane handling, and when the largest mold with one casting in it is lifted, there is 45 tons hanging on the crane hook. This company has made a great many crankshafts for 1000 and 2000 horsepower diesel engines, the crankshaft castings weighing 1 and 2 tons, respectively. The company also makes crankshafts weighing 5 tons each. It is hard to correlate the use of gray iron in these massive crankshafts with the layman's opinion of gray iron as a weak and brittle material.

Considerable effort has been directed toward the production of better materials for aircraft engine piston rings, but so far no material that is commercially feasible has displaced gray iron, although there has been outstanding improvements in the quality of gray iron going into this application.

Much Progress Made

The foundry industry has made a great deal of progress in this war, and the engineering materials processed in the foundry industry have shown a parallel improvement in quality. Future progress in the foundry industry primarily will depend on:

1. Co-operation by all branches of the foundry industry to expand the acceptance of the foundry process of manufacture.
2. Recognition by the gray iron branch of the foundry industry that it is the sole producer of that engineering material, and multiplication of its effort to learn more about this material and inform others.
3. Mutual effort to arrive at an intelligent method of handling war-generated surpluses.
4. Examination of the "know-how" of all phases of successful foundry operation, and correction of all deficiencies.
5. Avoidance in the ferrous foundry industry of short-sightedness regarding postwar competition from light metals and plastics.

This paper was presented before the New Jersey Foundrymen's Association at Newark, N. J., Feb. 28.

ECONOMY THRU QUALITY!

NAME ON REQUEST

Fifteen years ago his plant began using SAHARA on hot sand elevators and conveyors. Several years back, they tried out some competitive belts which—though lower in first cost—proved much more costly in service.

Today SAHARA is their standard.

NO RUBBER - PREWAR QUALITY

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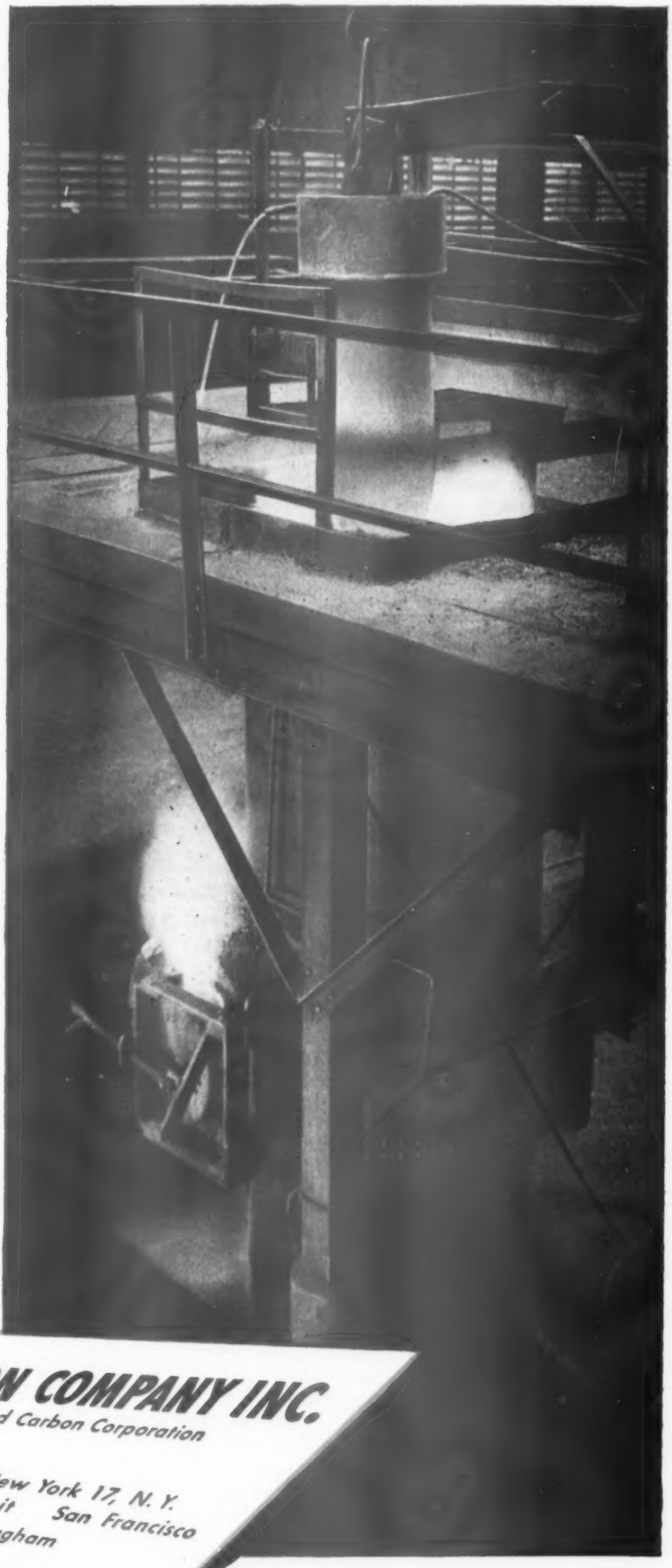
Methods of Hiring Women Explained

Methods employed by leading industrial concerns to recruit women workers are described in a report, "Recruiting Women Workers," issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., 1 Madison avenue, New York 10. Another report, "The Employee Counselor in Industry," discusses the use of counselors in orienting new workers to their jobs. Copies of the reports are available on request.

Number 1 of a Series: *"Looking at the 5 essential things you never see in electrodes"*

What's Cooking?



THERE'S PLENTY COOKING! Inside this electric calciner there are more things than just coal. And in every single one of the many operations in our three-months-long process of making carbon and graphite electrodes, these things are present.

We call them "the five essential things you *never see* in electrodes": Raw materials selection, manufacturing experience, manufacturing control, continuing research, and customer service.

Because of these five essential things, "National" and "Acheson" electrodes for electric furnaces have become steadily stronger, longer lasting, more economical. Since 1922 the average cost of graphite electrodes has declined approximately forty per cent.

All electrodes look much the same. But the measure of electrode value is deep under the surface . . . in the "five essential things you never see." For a close-up of these things, we invite you to call or write our nearest office.

NATIONAL ELECTRODES — ACHESON GRAPHITE

The words "National" and "Acheson" and the "National" Seal and "Acheson" Seal are registered trade-marks of National Carbon Company, Inc.

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Niagara Falls Cleveland Detroit San Francisco
Pittsburgh Chicago Birmingham

BUY UNITED STATES WAR BONDS

BETHLEHEM CASTS LARGEST INGOT MOLD

(*Concluded from page* 71)

to facilitate drying, collapse during the contraction period of the casting, and ready removal of the core from the finished casting. The core was reinforced with special cast iron arbors spaced about 12 inches apart, horizontally and separated by iron blocks to insure rigidity while the core was in the green state and before it was dried in the oven.

Lifting hooks extended from the plate in the bottom to within 30 inches of the top of the core and were braced at the top by spreader bars. Turnbuckles connected the hooks to two large links suspended directly from the crane hook. In this manner the strain could be adjusted equitably on the four hooks so that the core could hang true and level, first in its journey to the core oven and later in its passage to the bottom inside the mold. The entire arrangement was one of necessity rather than of choice owing to lack of head room under the crane.

Gated at Both Ends

Two 6-inch square sprues at each end, as shown in one of the accompanying illustrations, were built up as the ramming progressed close to each end of the pattern. The sprue openings were formed in 12 x 12 cast iron boxes 8 inches deep, filled with a dry sand mixture and baked in the oven. Each stack of boxes extended from the bottom to the top of the mold. Gate openings were provided at the bottom and again at a point 42 inches above the bottom, and these were supplemented by a number of pop gates on the top. The mold was covered by a number of loamed plates provided with suitable openings for the sprues and risers. About 10,000 pounds of metal were poured into the risers for *touching up* and to compensate for the natural shrinkage and contraction while the casting was passing from the liquid to the solid state.

Direct metal from the company's blast furnaces was used for this casting. The type of metal known as bessemer pig iron and employed extensively in the acid bessemer process and in acid open hearth steel practice, also is the metal usually employed by ingot mold manufacturers on account of its ability to withstand alternate heating and cooling strains. In this pig iron the silicon content ranges from 1.00 to 2.00 per cent, phosphorus not over 0.10 per cent and sulphur not over 0.05 per cent.

Total pouring time for the mold was 2 minutes and 25 seconds or at the rate of over 80 tons per minute. As a guide and indicator in pouring large volume of metal into a mold, an electrical device is employed to indicate when the metal has reached a point 30 inches below the cope. This indicator is an electrical siren wired in such a way that when the metal reaches the designated point, it forms a contact with two electrodes which are inserted down through one of the risers to complete the circuit. These electrodes, which are merely small steel rods, are removed immediately after they have performed their warning function. The reason pouring is stopped at this stage is because the volume of metal in the pouring basin is sufficient to fill the remaining space in the mold. Two separate skimming plates are employed to hold back the kish, charcoal and slag which may be floating on the metal in the basin. This practice has been developed through extended experience in pouring great volumes of metal into various types of large heavy castings over a period of many years.

Ultimate destination or purpose of the large ingot mold casting is not available for publication. It is understood that it will be used many times and eventually broken for scrap.

Meehanite Research Institute of America Inc., Pershing Square Building, New Rochelle, N. Y., has published an 8-page bulletin entitled, "A Study of Friction, Galling and Seizing" which gives results of an investigation of the effect of metal surfaces in contact with each other.

All New Metal
New Metal and High Purity Scrap
Selected Scrap plus Tin
Scrap
Composition "G" 88-10-0-2 88- 8-0-4 Cu-Sn-Pb-Zn
Bearing Bronze 80-10-10-0 84- 8- 8-0
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Use These **ALTERNATIVES** *Wherever You Can*

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"INGOT METALS OF TODAY"

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16 STANDARD INGOT METALS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
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Ajax Nickel-Copper 50-50%
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

•"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Notice how the arrows on the W.P.B. chart point to the *right*. . . . They show how alternative materials *currently available* can be utilized by foundrymen as now permitted by many designers. The purpose is to conserve primary metal at the mine through increased use of secondary ingots. Sometimes great ingenuity is called for, yet remember this:

The first program for scientific control of ingot metal was set up by Ajax 45 years ago. The result has been metal and practical technical follow-through in which Ajax increases your production by reducing rejects.

THE **AJAX METAL COMPANY** PHILADELPHIA
ESTABLISHED 1880

ASSOCIATE COMPANIES:
AJAX ELECTRIC FURNACE CORP. Ajax-Wyatt Induction Furnaces for Melting
AJAX ELECTROTHERMIC CORP. Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC. The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ENGINEERING CORP. Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

GRAY IRON FOUNDERS HOLD CONFERENCES

(*Continued from page* 69)

that most of the high profit foundries had good cost systems, and the majority of the low profit foundries had poor cost systems, consequently the average profit level of the industry was pushed down chiefly by those foundries which had poor cost systems.

If the proportion of foundries having sound cost methods had been 75 instead of 25 per cent, Mr. Carter stated, the average profit margin in a normal period like 1936-39 would have been doubled or approximately 8 per cent. If the additional 4 per cent had been applied to total sales for 1941, the gain would have mounted to approximately $30,000,000.

Mr. Carter pointed out that an effective cost system not only provides a sound basis for setting prices, but it also leads to lower costs by indicating opportunities where cost reductions exist. With cheaper competition in prospects after the war, there is a crying need for universal adherence to sound cost methods and for close control over costs before that period arrives. Mr. Carter stressed the menace of the price cutters and stated that the installation of cost systems results in the price cutter getting a better price for his castings. The speaker also stressed the importance of a sound cost system as a factor in securing releases through adjustments with the Office of Price Administration.

At Boston, H. B. McCoy, chief, Division of Industrial Economy, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, discussed postwar markets and the work of the Department of Commerce. Mr. McCoy stated that the department does not tell business men how to run their business, but it does collect facts to assist business men in analyzing their markets. He indicated that conversion to consumer goods will not start in quantity until and unless the war does not need the products of industry, and materials and labor are available for civilian production. He indicated that the government was taking an active interest in postwar planning.

Comprised of Small Businesses

In referring to the gray iron foundry industry, Mr. McCoy stated that this is essentially a group of small businesses scattered throughout the United States and therefore it will be subject to many problems confronting all small business in reconversion from war to peace. Since it is basic, the gray iron industry will be dependent to a large extent on the prosperity of other businesses. For those interested in an analysis of the postwar outlook, the speaker recommended the publication "Markets after the War" which is a hypothetical projection of postwar expenditures for goods and services after reconversion. Mr. McCoy stressed the competitive factors that have developed during the war and stated that the postwar period will see the greatest movement in product research and market research in the history of industrial activity. Industrial research will be carried on by the larger businesses, and the smaller businesses will accomplish the purpose through co-operative effort.

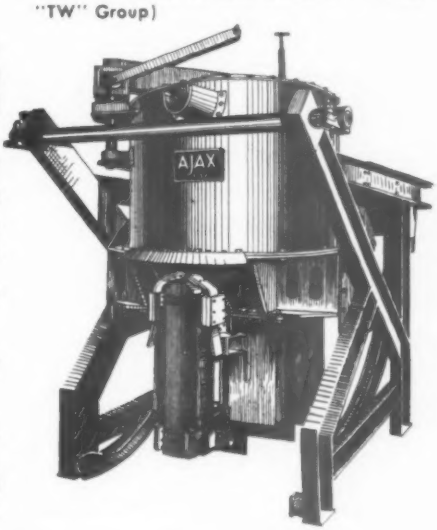
In conclusion, Mr. McCoy indicated that industry wants more marketing information and that the department proposes to provide this information to the extent of funds which will be provided by Congress. The collection and dissemination should give industry a valuable basis on marketing and distribution.

Weldon W. Welfling, chief, Gray Iron and Malleable Castings Section, Office of Price Administration, Washington, discussed "Price Control in the Gray Iron Castings Industry" in which he outlined the need for price stabilization as brought about by the war. The problem of inflation arises when the government creates and pays out billions of dollars which become income expendable for goods and services. According to the speaker, the volume of goods to be bought cannot increase indefinitely and there comes a time when a rising flood

PLANTS NOW MELTING ALUMINUM ALLOYS ELECTRICALLY ENJOY THESE SPECIFIC ADVANTAGES...

1. VASTLY INCREASED PHYSICALS (tensile strength and elongation) in foundry, die-cast, or rolling mill products.
2. DECREASED GAS ABSORPTION AND SEGREGATIONS hitherto due to conventional melting practice.
3. CLEAN-CUT, ACCURATE TEMPERATURE CONTROL during the melting and pouring stages.
4. GREAT EASE AND SIMPLICITY IN HANDLING ALLOYS that were once considered sensitive and difficult to melt.
5. ELIMINATION of oxide inclusions.
6. COOL AND CLEAN foundry operations.
7. DELIVERY of the rated production per hour on the hour, (production capacity 300 lbs. to 1250 lbs. per hour).

This is the first commercial electric furnace for melting aluminum alloys in continuous operation. It utilizes the famous Ajax-Wyatt low-frequency induction melting principle which has been applied successfully for nearly all wrought brass melted throughout the world. Write for new bulletins . . . (The "TW" Group)



AJAX ENGINEERING CORPORATION, Box 1418, Trenton 7, N. J.

THE AJAX TAMA-WYATT INDUCTION MELTING FURNACE

ASSOCIATE COMPANIES: AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

of dollars is being spent on a stable or a declining supply. At this point some control must be exercised to insure that essential production takes place without regard to the relative attractiveness of prices for various products. Mr. Welfling stated that if the government pursued a policy of acquiring what it needs by outbidding other buyers there would be no predictable limit to price rises. Under these circumstances reliance upon supply and demand to determine production, allocate supplies and create fair prices must be supplanted by emergency direct determinations.

The speaker stated that while the Office of Price Administration operates within a framework of law, the regulatory act itself does not contain a precise definition of "generally fair and equitable prices" so that the administrator has had to determine standards of general fairness and equity. The Office of Price Administration feels that prices are not generally unfair or inequitably low if they provide dollar earnings before taxes as large as those normally earned in prewar years, taking into account changes in investment. It was emphasized that the use of a base period is not at all a matter of regulating profits, but of course it is impossible to regulate prices without influencing profits.

In conclusion, Mr. Welfling stressed the need for proper information on which to base decisions. He urged upon foundrymen the necessity of providing the Office of Price Administration with all pertinent information whenever a problem is brought up under MPR-244. He stated that any information received concerning individual company operations is confidential material and is so treated.

At Boston, following Mr. Welfling's discussion, A. B. Root, vice president, Hunt-Spiller Mfg. Corp., South Boston, Mass., and a member of the Gray Iron Castings Industry Advisory Committee of the Office of Price Administration, spoke on the work of the industry advisory committee and discussed interpretations of Amendment 7 to MPR-244 as were prepared by Frank I. Turpen, head of the Iron and Steel Section, OPA, Region 3, Cleveland, and distributed by the society at the meeting. Mr. Root emphasized strongly the difficulties that have faced the committee, due to lack of accurate statistics on the gray iron foundry industry. He indicated that the reluctance on the part of individual foundries to give financial information is responsible for the difficult situation facing the industry now.

Described Present Labor Trends

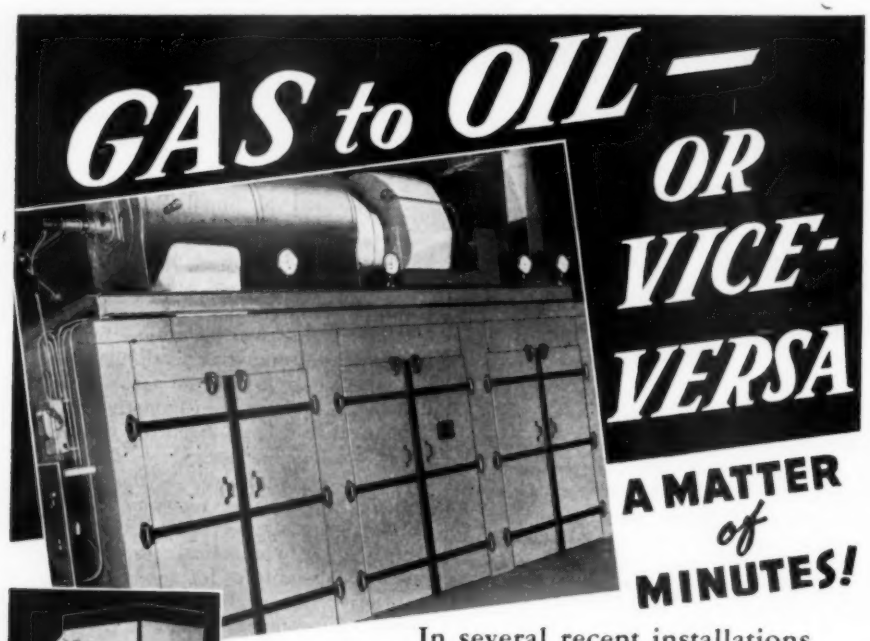
At New York, H. L. Edinger, president, Barnett Foundry & Machine Co., Irvington, N. J., vice president of the Gray Iron Founders' Society, and chairman of the Gray Iron Castings Industry Advisory Committee of the Office of Price Administration, led a similar discussion on Amendment 7 of MPR-244. An interesting question and answer period covering provisions of the amendment was featured at both conferences.

At New York Dr. Leo Wolman, Columbia University, presented a most interesting and instructive talk on the present trends in labor relations. He stated that while the present war is bigger than World War I and the degree with which we are using our natural resources and labor is much greater, many problems will be duplicated in the coming postwar period, perhaps not in the same places and in the same degree, but nevertheless duplicated. To explain his thoughts upon the subject, Dr. Wolman outlined the trends that developed in the garment industry during and after the war and discussed the results of these trends upon that industry in the city of Chicago.

According to Dr. Wolman many people now making policies which will control industry in the years to come are actuated by some very complicated motives. Although prominent speakers have stressed the desirability of holding wages at present levels following the war, Dr. Wolman stated that everybody knows wages are going to be deflated when peace comes, not by people but by conditions, including inability to absorb available labor.

In discussing labor relations Dr. Wolman stated that negotiation is nothing but conversation, and that industrialists

(*Concluded on page* 182)



In several recent installations Lanly designing has conformed to the needs of the day as to the fuel situation. Facilities have been provided to change quickly from gas to oil or vice-versa.

For use in localities not served by gas we are in a position to furnish ovens or furnaces efficiently heated by oil, electricity or steam.

You can look with confidence to Lanly for the very latest developments in designs, methods and equipment. Our record of progress and the high calibre of companies served confirm this statement.

Write for catalog and consult us regarding any assistance you may need in relation to industrial ovens or furnaces.

THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
750 PROSPECT AVENUE · CLEVELAND, OHIO

BUY
WAR
BONDS

FORWARD
to the tasks of Peace

WHAT a different story, perhaps had our pre-war planning been as anticipated as post-war planning! Yes, today foresight is replacing hindsight. Eyes are looking forward . . . visions of a postwar world are taking concrete form. And one of these days you'll be glad you thought first of things which today are last.

UNITED STATES ELECTRICAL TOOLS

today for war . . . tomorrow for peace

FLEXIBLE
SHAFT
MACHINES

For overhead or floor mounting. The power transmitted by a flexible shaft is governed by the diameter of the bore and the speed at which it is operated. Motors are ball-bearing, 40-degree ratings and will stand a momentary overload of more than 100%.

Reasonable deliveries—write today.

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

(*Concluded from page* 180)
should not be afraid of such conversation. Most assuredly representatives of labor are not. He also advised industry to know what it gives in reaching an agreement through negotiation. Getting rid of something in this country today is one of the most difficult things we have to do. In conclusion, he stated that industry has an obligation of being a party to letting the public know what labor relations are all about.

At New York, A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland, was honored by the society with the presentation of a scroll testifying to his valuable services as the society's president from 1941 through 1943 and for his work as a director of that organization.

John H. Van Deventer, editor of *The Iron Age*, spoke on "Forecasting the Future of the Foundry Industry" at the Boston luncheon meeting. The speaker pointed out that in his opinion the foundry industry was an infant among the industries of the world and that its future lies ahead. He stated that the greatest asset of the casting industry is the flexibility of its product. Imagination is the limiting factor of growth. In his opinion there is not enough research being conducted in the foundry field today.

At the New York luncheon, Brig. Gen. William C. Rose, chief, Executive Services, War Manpower Commission, Washington, spoke on "Re-employment of Veterans". General Rose stated that the director of selective service has a twofold responsibility under the Selective Service and Training Act which includes the establishment of a personnel division with a purpose of aiding veterans securing re-establishment in old positions, and the establishment of a personnel division to assist veterans to obtain new positions. The director of selective service, in carrying out the first duty, has established a veterans' personnel division. In carrying out the second mandate the director has requested the War Manpower Commission to assume responsibility in placing returned veterans in new positions through the facilities of that organization.

General Rose stated that the mounting significance of our employment service to veterans of this war is readily evident from the fact that for the year ended June 30, 1942, there were 206,856 placements whereas for the next year the number increased by 25 per cent. During the first six months of the current fiscal year 214,526 veterans have been placed, and it is anticipated almost 600,000 will be placed during the year ending June 30, 1944. The steady increase in placement is readily understandable since more than 2000 men per day now are being discharged from the armed services for various reasons, and so long as we have an over-all strength of some 11 million men, the number discharged will decrease.

Snagging Wheels
...THAT "HOG-OFF"
EXCESS METAL FAST
. . . Yet Give Long Wear
If you've never seen Dayton Snagging Wheels in action—we suggest you arrange for an immediate demonstration.
As hundreds of foundries have discovered — to their profit — Dayton's not only "hog-off" excess metal fast, but "wear long"—the way you want them to.
Made to the size, shape, grain and grade to suit your requirements. Write today.
SIMONDS WORDEN WHITE CO.
710 Negley Place, Dayton, Ohio
DAYTON GRINDING WHEELS

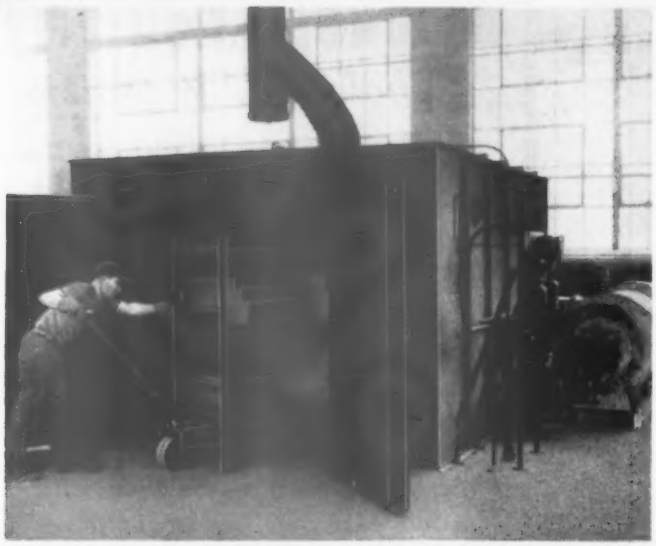
Complete Abstracts Of Patents

Abstracts of 7000 foreign-owned United States chemical patents seized by the Alien Property Custodian have been completed and are available through the Office of Alien Property Custodian, Chicago 3. They are grouped in 33 separate sections, and the price is $1 per section or $25 for all sections. Abstracts were prepared by a group of about 250 volunteers appointed by the Chicago Section of the American Chemical Society. Printed copies of the vested patents and applications to which these abstracts relate may be purchased only from the Commissioner of Patents, U. S. Patent Office, Washington 25, at 10 cents per copy.

Continental Adopts New Name

Continental Roll & Steel Foundry Co. has changed its name to Continental Foundry & Machine Co. The change is intended to describe more clearly the company's productive facilities, but does not affect the company's policies or products. Continental has plants located at East Chicago, Ind., Coraopolis, Pa., and Wheeling, W. Va., with general offices at East Chicago.

WHERE EXPERIENCE IS OF FIRST IMPORTANCE



There are few pieces of industrial equipment in the design and manufacture of which first hand experience and "know how" are of such vital importance as in industrial ovens. Factors which are seemingly negligible to the inexperienced often have far-reaching effects in the actual performance of an oven when finally put into service. Seldom do any two ovens, even in the same plant, operate under identical conditions. Allowance must be made for all the variables if maximum baking speed and economy are to be realized.

In addition, the oven design must take into consideration the probable future changes in the user's product and be flexible enough to accommodate such changes.

If you want maximum oven effectiveness and highest baking speed, take advantage of the broad experience of oven engineers who devote all of their effort to this branch of engineering and have proved their ability.

YOUNG BROTHERS COMPANY

6508 MACK AVENUE **DETROIT 7, MICHIGAN**

YB CO

METALLIC MATERIALS REPORT

(*Continued from page* 73)

ferred, so the tendency has been to cling to the 80-10-10 composition. When that composition is demanded, and the "impurity" limits are low, only scrap of 80-10-10 composition can be used, available scrap of other types cannot be worked in, so the requirement for new tin is high. It would also be helpful if the requirement for new copper could be kept low.

The extent of real engineering need for the high compressive strength of 80-10-10 has been questioned by Etchells and Underwood[25] who point out that if a plain bearing has to start under load, the permissible load is limited by the permissible starting torque, so that, unless some means is employed for lifting the journal from the bearing before starting, the unit load is held down to the order of 250-300 pounds per square inch of projected area. The straight copper-lead alloys will stand some ten times this load when operating at 300 degrees Fahr., so the use of alloys of very high compressive strength may not be as necessary as it often is considered to be.

Carrying this thought over to the less highly leaded alloys for bushings, it may not be necessary to strengthen the matrix, i.e., 90 copper, 10 per cent lead, with no use of tin, might serve in some instances where 80-10-10 previously has been used, since it withstands seizure better than 80-10-10. Another alloy of as good seizure resistance as 80-10-10 and much the same order of compressive strength is 85 copper, 10 lead, 3 tin, 2 per cent antimony, in which antimony replaces several times its weight of tin. Reasonable amounts of zinc appear compatible with this; consequently, scrap from which some of the zinc has been removed, as by melting in a cupola could be used to supply both the tin and the copper.

Still another alloy similar in general properties to 80-10-10 is 80 copper, 2½ tin, 2½ zinc, 10 lead, 5 per cent manganese, made for example, from scrap 85-5-5-5, and scrap copper, with the addition of the manganese and of such additional lead beyond that in the scrap, as is needed to bring it up to the 10 per cent level.

Lead Is Important

In fact, the most important feature of a bushing alloy seems to be the 10 per cent lead, and whatever level of strength and hardness the service demands the matrix have, between that of straight copper in 90 copper, 10 lead, and that of a bronze with copper and tin in the 80-10 ratio of the 80-10-10 alloy, can be provided from scrap and from other hardening elements than tin.

Finally, it should be recalled that for some types of service, cast iron, with its smearable graphite flakes for initial protection, and the places from which graphite has been removed, to serve as tiny oil reservoirs for later stages, and for others, porous bushings of common bearing alloy composition, or even of iron made by powder metallurgy methods and soaked with oil, have their places.

Uses for metals at high temperatures in furnace parts, oil stills and other equipment for the petroleum industry, in high pressure, high temperature steam power generation and conversion to electrical energy, in pressure vessels for the chemical industry, in engine parts, etc., seldom present simple problems, the service conditions usually demand resistance to more than one deteriorating factor. The parts often are bathed in hot gases of combustion, which, despite the combustion engineer's terminology of "oxidizing, neutral and reducing flames" as relating to completeness of combustion and content of carbon monoxide, are generally strongly oxidizing. Chemically reducing conditions sometimes are met and the atmosphere may change from reducing to oxidizing, in normal service.

The fatigue problem ordinarily is overshadowed by other problems, at least at the higher part of the high temperature

(*Continued on page* 186)

Simplicity
FOUNDRY EQUIPMENT
holds a key position
in casting production
in over 500 Foundries

This is shown by the statements recently made in writing by many of our users. Shown below are a few excerpts from some of these letters.

★ ★ *"I sincerely believe that without the use and continued operation of the Simplicity shake-outs now in our plant, that it would lower our production between ten and twenty percent."*

★ ★ *"Your machines not only save labor during the shake-out operation, but we find the greatest savings in flask equipment and the castings come truer to form, particularly when shaken out hot."*

★ ★ *"We believe the Simplicity Equipment is one of the most vital in the Foundry Industry today."*

Every Simplicity Screen and Shakeout sold carries our full guarantee covering both mechanical construction and its ability to do the work for which it was recommended.

SIMPLICITY ENGINEERING CO.
DURAND, MICHIGAN
For Canada: Waterous Limited, Brantford, Ontario

WASHED DRIED AND SCREENED SILICA SAND

Carefully Selected and Graded for Foundry Use—

FOUNDRY men throughout the country know the exceptional qualities of the uniformly screened grades of silica sand produced by the Ottawa Silica Company.

The grains being almost spherical, afford greater permeability and consequently finer sand can be used, effecting better finish.

Ottawa sands are durable! They do not break up! They are ideal for sand slinger work and are without equal for all foundry purposes where synthetic sands are employed.

FLINT MOLDING AND CORE SAND SILICA

A HARD, fast-cutting, thoroughly washed, dried Sandblast Sand, screened to uniform size, is produced by the Ottawa Silica Company and sold under the trade names FLINT SHOT and DIAMOND SANDBLAST SAND. It is the most economical agent that can be employed for all kinds of exacting sandblast cleaning. The round, pearl-like grains are hard as flint. They do not split up, but wear down uniformly and can be used over again many times. This abrasive flows freely, requiring less air power and gives the castings a smooth, silvery-like, velvety finish. Ask for our booklet, "Sandblasting Up To Date".

FLINT IT PAYS TO USE SHOT

DIAMOND SAND BLAST

THE Ottawa Silica Company's three mills operate continuously the year round, making it possible to supply foundries with material promptly. Production includes a complete line of foundry sands suitable for molds, cores, furnace bottoms, sandblasting, for use generally in the steel, grey iron and non-ferrous fields—also Ground Silica (Silica Flour). The Ottawa Silica Company's engineering staff is always available for consultation and service on problems relative to the use of Ottawa Sands.

CRYSTAL 99 19/20 PURE SILICA

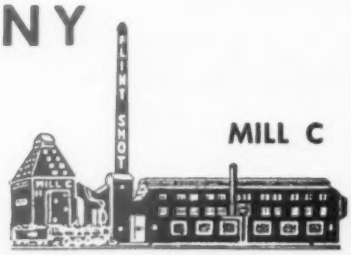
OTTAWA SILICA COMPANY

Ottawa, Illinois

MILL A

MILL B

MILL C



(*Continued from page* 184)

range. In those cases in which a long service life is inherent in the design, the loads which produce the low limiting creep rates and total deformations are considerably lower than the endurance limit, so creep rather than fatigue is the controlling design factor. In those cases in which a very limited service life is the basis for design, resulting in high loads and appreciable allowable deformations, the stresses which produce fracture in 1000 hours are sometimes of the same order of magnitude as the endurance limits, and fatigue problems need to be considered. The damping capacity of alloys used at high temperatures is known to vary considerably with composition. Care must be taken so that in materials with low damping capacity, vibrations do not build up stresses in excess of the fatigue limits. It is a disturbing factor that in many high-temperature fatigue tests, there is no apparent tendency for the stress-cycle-to-fracture graphs to level off and develop an apparent endurance limit as in the case of many steels at room or moderately elevated temperatures. Fractures have been obtained in some austenitic alloys after 2.5×10^8 cycles at 1200 degrees Fahr., and until tests of still greater duration are available it is conservative to assume that at still lower stresses fractures may occur after a considerably greater number of stress reversals. However, a considerable program of high temperature fatigue tests, in specially designed apparatus[36], is under way which should make clear how far the designer can continue to disregard the fatigue question in relation to high temperature behavior.

All this adds up to the conclusion that it is impractical to attempt a "hand-book listing" of high temperature properties from which can be selected the exact alloy or alloys suitable for the many variations in stress, temperature, corrosive conditions and time called for in high temperature service. Even more forcibly than in most design problems, materials for high temperature service have to be selected to meet the exact conditions of service, and test information obtained under other than those conditions is even more likely to be untrue and misleading. Much of the most important information is that relating to metallurgical stability. Metallurgists have tended to sidestep this problem in the past by advocating compositions far over the border-line of any doubt as to stability. Scarcity of alloying elements makes it necessary to sail closer to the wind in that respect and to hunt for quite new alloys of the necessary properties that require less of the strategic metals.

Sky Is the Limit

Concurrently, new war requirements demand alloys of hitherto unattained properties for uses so important that the sky is the limit in the degree of alloying or choice of alloying element, since the necessary amount would be pinched off from something else of less military importance. Consequently the whole art of high temperature alloys is in a state of flux, with many promising leads not yet sufficiently explored to allow definite statements and some definite achievements not stateable because of war censorship.

Up to around 1000-1100 degrees Fahr., respectable load-carrying ability, plus a tailored degree of oxidation and corrosion resistance, can be built into ordinary and only relatively slightly alloyed steels, but for high load carrying ability at more elevated temperatures, recourse must be had to the "austenitic" types, the steels that do not harden on quenching and are not amenable to the usual sort of heat treatment. They may respond to precipitation-hardening treatment, so the composition is balanced and solution and aging heat treatments chosen so that advantages rather than disadvantages result from the particular precipitation phenomena involved.

The least highly alloyed austenitic steels in common use have composition approaching 18-8, i.e., 18 per cent chromium, 8 per cent nickel. The creep strength of this at 1100 degrees Fahr. is two or more times as high as that of the ordinary low alloy steels, and it still has some load-carrying ability at 1400 degrees and a bit above. For use in the intermediate temperature range from

(*Continued on page* 188)

Ingenious New

Technical Methods

Presented in the hope that they will prove interesting and useful to you.

Precision Ground Glass Gages Afford Visibility in Inspection

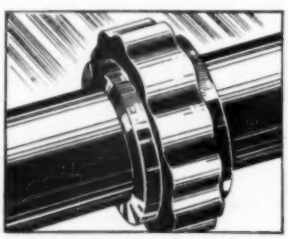
In the hands of the skilled mechanic, glass gages bring an important plus function to precision gages. It not only checks the new tool's size, but gives the inspector an idea of what kind of surface to expect from that particular tool. The visibility permitted by the glass gage allows the inspector to see the surface in blind holes as well as through holes.

Some of the apparent advantages of the glass gage follow: Glass gages afford visibility in inspection. Glass gages are not subject to corrosion. There is less tendency to gall in some applications. Sense of feel is more pronounced when using glass gages. Because the thermal conductivity of glass is less than steel, body heat of inspectors will not be transmitted so rapidly to the gage to affect gaging dimensions.

Chewing gum, too, is really useful and helpful in these tense times to people who are working on the production front making material for our war effort. But, our Armed Forces have been constantly increasing their demands for Wrigley's Spearmint, Doublemint and Juicy Fruit. It is only natural that we and you both feel that the needs of our fighting men and women come first.

You can get complete information from Industrial Glassware Division of the T. C. Wheaton Co., Millville, N. J.

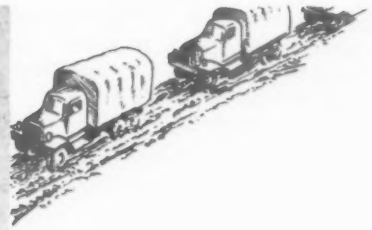
Glass gages are not subject to corrosion or rust

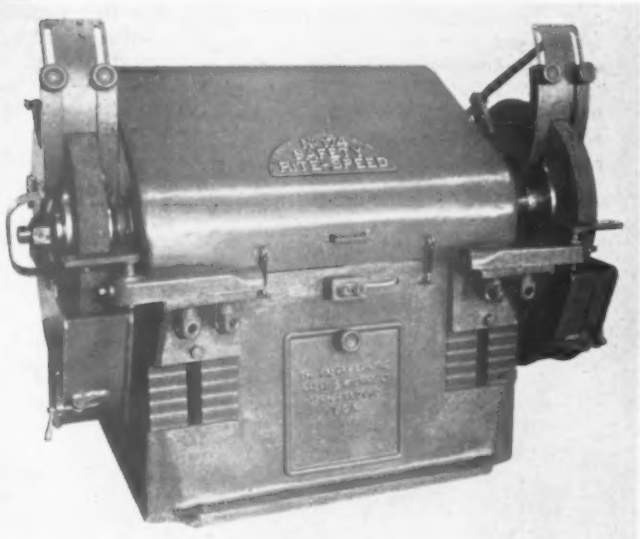


Visual inspection of surface coincident with inspection for size.

Y-113

WHEN PRESSURE IS ON FOR *More* WAR MATERIALS *Faster*



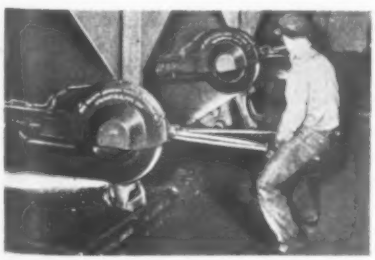


SAFETY Grinding Wheel Foundry Equipment
Makes New Production Records a Standard Performance

Many of your men are now "over there". Replacements are inexperienced or not to be had at all. And you've got to produce *more* material *faster!* In a jam like that, SAFETY Grinding Wheel Foundry Equipment steps in and does a grand job.

Take, for example, the SAFETY "Rite-Speed" Double End Stand Grinder illustrated above. Its changeable speed leaves nothing to chance. It automatically cuts off power when grinding wheels wear to a predetermined diameter. With these, and other, exclusive features, it does finer, faster work even with less experienced operators. The SAFETY Swing Frame Grinder is another SAFETY product that is increasing output and simplifying operations in scores of leading industries. And there are others equally important.

If top production, finer finish and bottom cost is what you're after, SAFETY can help you. The facts would prove most interesting. Why not ask for them? Contact any of the addresses below and you'll get quick action! Your inquiry implies no obligation, of course.



SAFETY De Luxe Swing Frame Grinder

Use it with SAFETY Grinding Wheels and you'll get faster, safer snagging than you ever before thought possible. Production, of course, goes up; cost goes down!

**Illustrated at top: Safety "Rite-Speed" Double End Stand Grinder*

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★ Syracuse—3-2131 ● Milwaukee—BLuemound 0742

(*Continued from page* 186)

1200 to 1600 degrees Fahr., chromium-nickel-iron, cobalt, and nickel-base alloys with suitable additions of molybdenum, tungsten, columbium, titanium, tantalum, and nitrogen show usable load-carrying ability. For load-carrying ability at 1800 degrees and above, still more highly alloyed compositions, such as 24 per cent chromium 12 per cent nickel, or 16 per cent chromium 25 per cent nickel plus several per cent of molybdenum, tungsten, or columbium, or a combination of these are required. Some of the nickel may be replaced by manganese, though not very much is known about what this replacement does to load-carrying ability.

The wrought alloys are more readily produced with low carbon content than the cast alloys, and some of the complications are reduced when the carbon is low. The stronger, more highly alloyed compositions are not easy to roll or forge and compromises have to be resorted to when fabrication by hot or cold working is necessary. In these, as in all castings, it should be emphasized that a design that allows adequate feeding, and careful foundry practice, to produce a sound casting, are far more important than the particular composition used, when each composition is balanced reasonably well.

Still more highly alloyed compositions than 25 chromium, 12 nickel, are used for heat-resistant purposes, one of these approximating 15 chromium, 35 nickel, being often considered superior to 25-12 for extremely severe service, though evidence on this score is not convincing save in a few very special cases.

The War Production Board has urged that users of 15-35 shift to 25-12, and those of 25-12 to 18-8, and this has been done successfully in many instances.

The design engineer is concerned directly with the properties of the finished part, and his specifications must be written so that the desired properties are, and the necessary quality is, secured. It is equally necessary that the material be chosen so that processing from the raw material to the finished part is feasible, so that quantity production may be secured.

Machinability must be considered when the designer picks a material, even though, with modern tool materials, modern machine shop methods, and the adaptation of grinding to rapid production, the old limits have been vastly extended upwards. Even in so important a material as armor plate for tanks, it is good sense to keep the hardness down to where it just can be reasonably well machined, and get a lot of good tanks rather than to push the hardness up to where the armor might be a trace better, but the production of tanks would be small, because of the machine shop bottleneck.

Machinability Is Important

What was unmachinable yesterday is machinable today, due to improvements in tool materials, machine tools and machine shop technique, and the range of grindable materials likewise has been increased greatly by improvements in the technique of grinding. Cost saving and increased production are such determining factors that ease of machining is a most important attribute in a metallic material of construction.

Without attempting to deal with fine-haired differences, it may be noted that, by nearly any criterion, commercial magnesium alloys, leaded bearing bronzes, leaded brasses, graphite-containing materials such as malleable iron, gray cast iron, graphitic steels, and high-sulphur steels such as commercial screw stock, all of which give short, crumbly chips, are very readily machinable, while tough and gummy materials like pure copper, pure aluminum, nickel, and monel metal rate as difficult to machine, as do steels of high hardness, and austenitic steels of great propensity toward work hardening.

Soft, or at least relatively nonabrasive materials that can be disseminated uniformly as constituents or inclusions, best fill the requirements, with graphite in cast iron and lead in brass as outstanding examples. Manganese sulphide in steels, i.e., an increased sulphur content, is a great standby.

Iron carbide (or complex carbide in alloy steels) is a brittle constituent whose distribution can be controlled by heat treatment, and which, from the point of

(*Continued on page* 190)

NORBIDE* Nozzles
Last Longer!
NORBIDE Liners in pressure blast nozzles are showing startling results by increasing nozzle life many hundreds of times and improving the over-all efficiency of the entire blast cleaning equipment. Norton Boron Carbide (NORBIDE) is the hardest material made by man. This explains the resistance to wear of NORBIDE Nozzles, the reason why the orifice retains its size and shape thereby reducing air consumption and keeping the stream of sand or shot concentrated.
Distributor—PANGBORN CORP., Hagerstown, Md.
NORTON COMPANY
WORCESTER 6, MASSACHUSETTS
*Hardest material made by man

Carl-Mayer CORE AND MOLD OVENS

All Types—All Sizes Heat Treating Ovens, Furnaces

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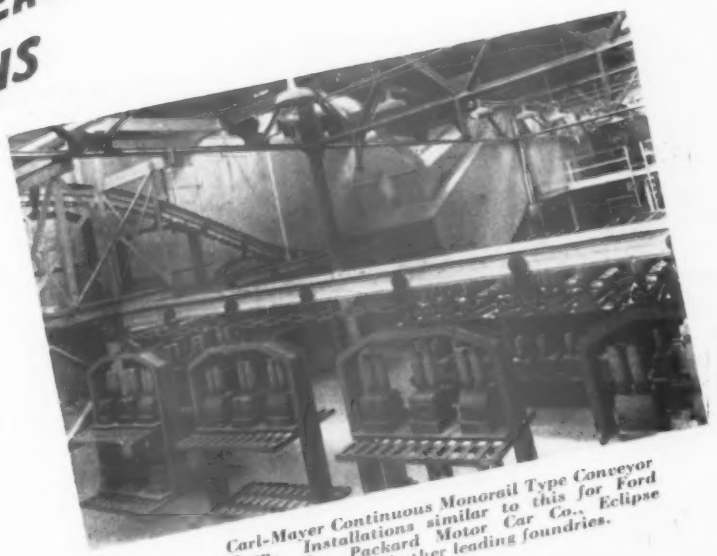
Leadership Proven BY REPEAT ORDERS FROM CONCERNS LIKE THESE:

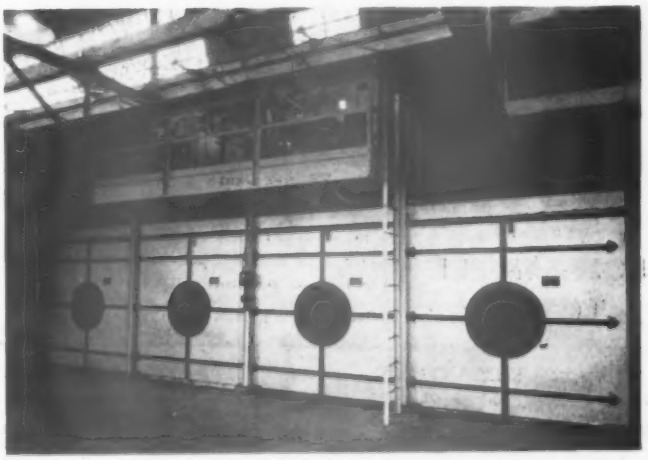


Carl-Mayer Continuous Monorail Type Conveyor Oven. Installations similar to this for Ford Motor Co., Packard Motor Car Co., Eclipse Aviation and other leading foundries.

● There's No Substitute for Carl-Mayer's Creative Engineering!

Leading foundries are obtaining better, faster and more economical core baking and mold drying from Carl-Mayer Ovens, otherwise they would not install Carl-Mayer Oven Equipment repeatedly in face of wide competition.

Wire or write for illustrated Bulletin 141, or a Carl-Mayer Oven Engineer.

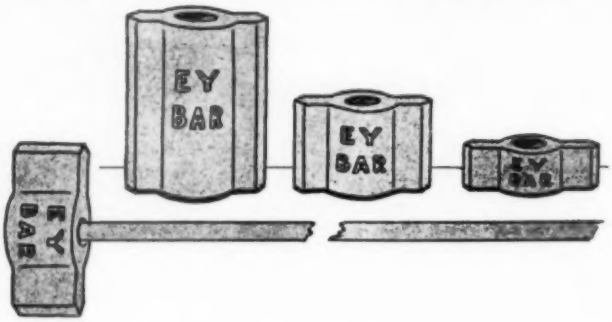


One of many batteries of Carl-Mayer Recirculating Air Heater Type Core Ovens at American Magnesium and Aluminum Co. of America.

THE CARL-MAYER CORPORATION
3030 Euclid Ave., Cleveland, Ohio
Backed by 25 Years Experience

ALUMINUM

TRADE **EY-BARS** MARK



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THE CLEVELAND
ELECTRO METALS CO.

CLEVELAND, OHIO

Up goes production *with* No.90 IRON OXIDE

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Cuts cleaning costs—speeds production.

Super-TAMASTONE

"The perfect pattern compound" speeds production as much as 400%, cuts costs 75%—converts loose and metal gated patterns into match plate production, good for extra thousands of impressions. . . . Place your order Now!

TAMMS No. 100 CLEANER

Why waste valuable time in scouring and scraping your metal core boxes, drier plates, blow plates, core vents, etc., when Tamms No. 100 Cleaner will do the job easier and quicker. Tamms No. 100 Cleaner is non-injurious to metals.

TAMMS SILICA CO., 228 F N. La Salle St., Chicago 1, Ill.

(*Continued from page* 188)

view of machining, is interspersed within the tough matrix, much as inclusions are. Its hardness and abrasive action make it oppose machinability, while its introduction of brittle stepping stones favors it. Therefore heat treatment is a potent factor in machinability, and can be applied to steels pretty much irrespective of alloy content, but not irrespective of a given heat and the method by which the heat is "finished".[2]

In low carbon steels it is feasible to raise the phosphorus content and thus secure embrittlement of the chips without embrittling the steel. Nitrogen has a somewhat similar action. Lead, in amounts usually under 0.25 per cent, can be used to increase machinability of a wide range of carbon and alloy steels with little or no harm to mechanical properties.

Other nonabrasive insoluble materials, such as silver or bismuth have a similar effect.

Selenium may be used along with sulphur in steel, and is a well-recognized addition to stainless steels. Selenium or tellurium likewise are used in copper-base alloys. Bismuth and lead are used in aluminum-base alloys.

Structure May Be Adjusted

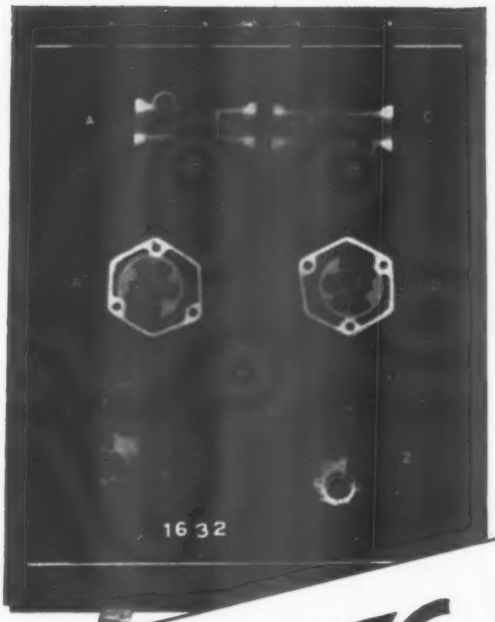
In steel, the grain size and the distribution of carbide affect the speed with which machining can be done and the finish produced, so that heat-treatment and grain-coarsening propensities can be adjusted for the desired type of machining and final heat treatment of the rough machined or the finished part then given to secure the desired mechanical properties. Discussion of this phase of the subject necessarily leads into metallurgy and the use of metallurgical terminology beyond the point of interest of most design engineers.

Specifications often require that steel be made by some particular melting process, or that certain processes be excluded. Old nonferrous specifications required "virgin metal" and barred scrap. Users often specify forgings and will not consider castings, for a particular use.

These stipulations attempt to accomplish, by indirection, some unstated end. They are usually a product of ignorance of how to test for the needed properties, though sometimes they result from sheer stupidity.

Converter cast steel had a black eye for a long time and was barred by many specifications on the assumption that it was brittle and unsafe, allegations which those conversant with the product knew were unjustified. Knowledge of the effect of grain size and of certain types of sulphide inclusions and the means of controlling both to avoid brittleness, grew up in a separate compartment but was not applied by the specification makers, though the metallurgists knew that these means were quite as applicable to converter steel as to that made by any other process. Instead of specifying toughness and making toughness tests, the specification makers stuck to the old misap-

(*Continued on page* 192)



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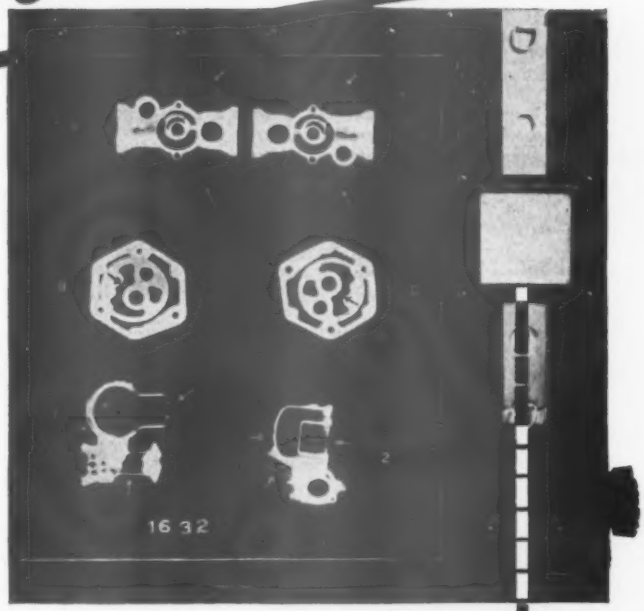

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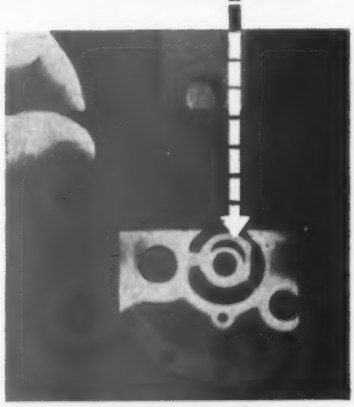

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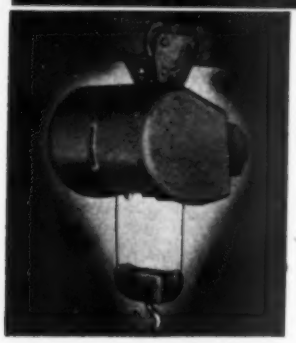

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(*Continued from page* 190)

prehension. Actual tests proved that the banned converter steel, properly handled, was not lacking in toughness, while the permitted electric or open hearth, improperly handled (in a way not avoided through any provision in the specifications) was lacking. Hence, specifications are being broadened so that converter cast steel is not barred when it is made properly.

The designer's specifications for steel parts which, from the production point of view, could be made either from wrought or cast material, seldom allow that choice. Many parts have been made from forged blanks for so long a period that a shift to castings appears revolutionary.

Since no hot work is put upon a casting, castings are almost free from directional properties, but they are more difficult to heat-treat to the optimum properties for that type of material. It takes longer heating to produce uniformity in the high-temperature structure of the steel when the crystals are large, as in the casting, than when they have been smashed up, as they are in forging or rolling.

However, if homogenization has been adequately carried out, heat-treated castings have, in all directions, a near approach to the properties shown by longitudinal specimens of forged or rolled steels, with much better equality of transverse properties.

Can Eliminate Troubles

In a comparison of forged and cast steels, for the particular heats tested, polished specimen endurance limits were higher for the forgings, but the notched endurance limits were higher for the castings.

On the other hand, it is difficult to feed a freezing casting of complex shape so as to insure that all of the pipe and shrinkage voids are located in the risers and cropped off, just as the pipe is cropped from the ingot for forging or rolling. Therefore the center of a casting may be less dense and more spongy than that of a forging. This is avoided in the centrifugal casting of cylindrical objects, where the shrinkage voids are concentrated in the interior so that when the interior is cleaned up by machining, the casting is effectively cropped.

Sand castings are more likely to contain blowholes from entrapped gases, introduced in one way or another, than is an ingot. The more complex the casting and the more devious the path the gases have to travel through the freezing metal, the less likely their opportunity for escaping. However, by cutting up sample castings to find out whether blowholes or other types of porosity regularly exist at definite locations, gating and feeding almost invariably can be adjusted to prevent the trouble. Radiographic examination will tell whether large blowholes or voids exist in castings, and routine x-ray or gamma ray examination often is prescribed for castings for severe service. Blowholes or poros-

(*Continued on page* 194)

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As a result of the test, SAFCO Core Oil #408 and Tykor Compound replaced the core oil previously used in this foundry. The core room foreman reported that the SAFCO combination produced soft-centre, hard-surfaced cores and that casting losses due to shrinkage cracks had been eliminated. Cleaning time, too, was substantially reduced.

Tykor Compound Reduces Shake-out Time—Eliminates Cracks

An Illinois foundry producing malleable iron castings was experiencing difficulty with the oil-sand cores they were making. Cores strong enough to permit handling caused shrinkage cracks; cores weak enough for ready collapsability broke too easily in handling. The condition was discussed with a Swan-Finch Service Engineer, who recommended the use of SAFCO Tykor Compound as the solution.

Foundry officials agreed, and Tykor was added to the mix, the cores then being sprayed with a solution of 1 part Tykor to 2 parts of water—a remedy that proved to be immediately effective. Core loss due to breakage was reduced—shakeout time was cut down materially—and shrinkage cracks eliminated.

Actual foundry records, like those given above, attest to the outstanding performance characteristics of SAFCO Core Oils and Compounds. Better results, however, are not the only advantages you may expect as a Swan-Finch customer. Of almost equal importance is the skilled training and experience which the Swan-Finch Service Engineer places at your disposal . . . experience which is invaluable in the selection of the proper core oil to improve specific conditions. This is the point at which improved core production really begins . . . and results in your own foundry will prove the wisdom of seeking expert counsel in core making problems.

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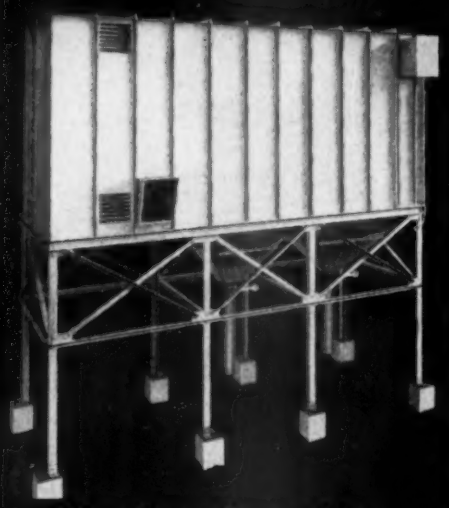

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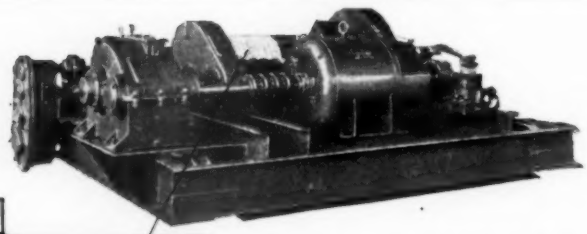

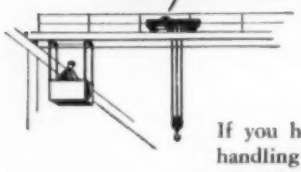

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(*Continued from page* 192)

ity in a lightly stressed portion of the casting may be of no engineering moment, and quite harmless, in which case it may suffice so to gate the casting that the holes are "chased" into a harmless location.

That it is not necessary to forge or roll to produce steel parts capable of severe service is evident from the fact that large guns alternatively are produced from steels of suitable hardenability, by forging, or by centrifugal casting. Either one, after heat-treatment, withstands the cold-stretching process of "autofrettage", proof-firing with increased charges, and service. In fact, the greater equality of directional properties in the cast gun make it preferred by some authorities.

Hence, there is no inherent objection to steel castings for those services for which forgings normally are used if it is established that the castings are free from voids and have been heat-treated correctly.

Substitution of a casting for a forging often allows approaching the contour and dimensions of the final part much more closely than is feasible with the forging, with resultant saving in machining costs and in the amount of turnings produced. Turnings are not as acceptable melting stock as heavy scrap, and their use often results in loss of much of the alloying elements they contain. From the points of view of economy and efficiency in production, and of conservation of alloying elements, castings often have very real advantages.

Final Properties Are Similar

A notable case is the Ford cast crankshaft replacing forgings, and requiring the removal in finishing of only about half the weight that has to be removed from the forged blank.

In steel, a shift from forgings to castings involves no major difference in final properties. When the final properties required are so low that an alloy may be used that is amenable to die casting, still greater savings in machining cost are achieved, since die castings can be produced so close to the required finished dimensions. Zinc-base and aluminum-base alloys are being die cast in great quantities, and the process slowly is being extended to some types of brasses, though these are more difficult to handle.

Nonferrous castings also are being produced to close tolerance in plaster molds. "Precision casting", along lines long taken advantage of in the dental industry, is being applied, even to some very high-melting alloys.

Small gears, formerly made from cast iron, brass or bronze by machining, may be made by die casting of zinc-base alloys, by plaster mold casting of brass, or from powered iron, that need almost no machining and are adequate for the light service intended.

Blind adherence to a given method of production and rigid specifications that

(*Continued on page* 196)

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(*Continued from page* 194)

bar the use of any other, are obviated much more readily when the design engineer considers his choice of material in the light of adequacy for a particular service rather than identity with what formerly was used.

A good example of this is in the replacement of the slow process of carburizing to produce a wear-resistant case, by the extremely rapid method of surface hardening by heat-treatment.

A specification is merely a language which the user and supplier employ to express what the user wants and what the supplier agrees to give him.

Once the desires of the buyer are expressed in a specification, the supplier has only to comply with the letter of the specification. If the buyer has not correctly stated what he wants, or has not used the correct language in expressing his wants, he is not sure to get what he really wants. Hence, the enterprising supplier does not rest content with an inquiry couched in terms of some standard specification, but sends a "sales engineer" to inquire what the particular intended use is, so that he may go back of the formal statement and see what should be done in between the lines, and supply what is adequate for the purpose. Such a verbal discussion does bring a meeting of the minds and an interpretation of the specification into its true meaning.

May Be Compromises

Material specifications are likely to be compromises. Different users state their knowledge, beliefs, and superstitions as to what they need, expressed in chemical composition or in terms of standard property tests. The producers object when the alleged requirements cannot be met, but are not concerned if the requirements can be met, even though they have no pertinence. The result is a specification describing the material in terms of chemistry and commonly determined properties without any footnotes pointing out that the prescribed chemistry is only a means to the end of obtaining the properties. Among the properties, one for instance, is truly needed in a given type of service; the others are not necessary but merely go along at some normal level along with the truly desired property.

With such a specification to meet, the inspector rejects the material if it deviates from the chemical composition set in a single respect, no matter if the composition in other respects has been so adjusted that the properties are what they should be, and he rejects if one of the unimportant mechanical properties, one unused in the intended service, is not as specified. That is all he can do, in view of the language used.

Utterly stupid "virgin metal" specifications were long imposed by certain large purchasers of some of the nonferrous metals, without regard to whether the use of secondary scrap really introduced any undesirable impurities or caused any deterioration in properties.

(*Continued on page* 198)

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3. Blaw-Knox (size No. 311, rated ¾ cu. yd.). Single Line Open Head Hook-on Type Bucket with safety hub trip reeved two parts of line 8' 9" operating headroom.
4. Blaw-Knox (size No. 309-F, rated ¾ cu. yd.). Extremely Low Headroom Single Line Hook-on Type Foundry Bucket requiring 6' 7" operating headroom.
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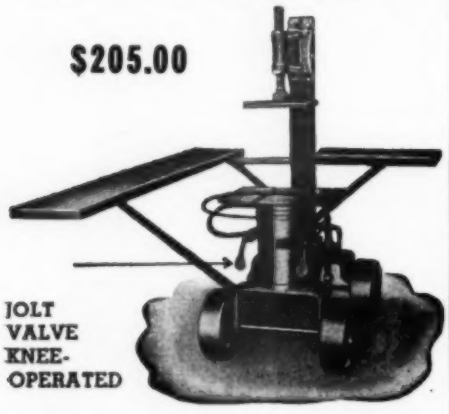

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(*Continued from page* 196)

even properties having no relation to service. Steel has always been made with a large proportion of scrap, so users did not have the nerve to call for "virgin steel". Scarcity of nonferrous metals long since led to the general abandonment of the "virgin metal" requirement.

The high strength copper-base alloys, aluminum bronze and manganese bronze, reach their strength level through use of a variety of hardening elements. Iron and nickel are common additions to aluminum bronze. Manganese bronze, actually a high strength brass, ordinarily contains (besides zinc), iron, manganese, aluminum, and tin, these elements being introduced by means of a previously prepared "hardener" alloy.

It is well recognized that the proportions of different elements in the hardener are not critical. For example, either of the following is an accepted composition: Copper 58 per cent; zinc 39 per cent; aluminum 1 per cent; manganese 1 per cent, and iron 1 per cent. Copper 67½ per cent; zinc 21 per cent; aluminum 5 per cent; manganese 4 per cent and iron 2½ per cent. The latter is a cross between common aluminum bronze and common manganese bronze.

The A.S.T.M. Specifications B147-42T for sand castings are shown in Table III.

Now it is also known that silicon is an effective hardener for copper, and a variety of silicon bronzes or brasses in which manganese, iron, and zinc are used, as well as silicon, are in commercial use. Naturally the question arises why silicon might not be admitted in the concoction of a high strength brass.

Forms Useful Material

It is known from American experience, that alloys with 50 to 65 per cent copper, hardened with appreciable percentages of manganese, iron, aluminum, and silicon, with nickel admissible, tin not needed, balance zinc, are useful both in cast and wrought form and that a good many changes can be made in the proportions of the hardening elements. These complex brasses with 1 per cent or more silicon are said to show notably good bearing and anti-seizing properties, probably due to the presence of silicides.

Such alloys can be made from yellow brass scrap, low grade secondary aluminum, etc. The presence of iron, nickel and tin from miscellaneous scrap is admissible. The high zinc content saves copper, in comparison with aluminum bronze and silicon bronze. If specifications were drawn solely on mechanical properties, without the arbitrary listing of specific compositions with only 0.1 or 0.25 per cent leeway as to elements not listed, high strength alloys could be made from available scrap.

Saying what you mean, but if you don't know how to express it, not trying to say it, is good practice anywhere, doubly so in specifications. Refraining from imposing unnecessary requirements is as important as finding out and including those that are necessary. As the restrictions are added, the difficulty of complying with them multiplies.

Sound specifications are drawn on the basis of good engineering judgment and interpretation of test data. We need the right data to interpret. Metals are honest, they answer the questions we ask them in testing. But they don't answer the questions we don't ask. It is the unasked questions, the properties assumed by implication, that are missing cogs in material specifications.

When the minds of the design engineer, the testing engineer, and the metallurgist meet on a common ground, with the designer willing to specify anything that is adequate, without limiting the material to what he used before; the testing engineer ready to plan tests to evaluate adequacy for a specific purpose, and the metallurgist disabused of the idea that data from standard tests are proof instead of just evidence, progress can be made.

Each one will then ask the other some embarrassing questions. The designer will outline the problem of selection of an alternate material, or one of improved properties, for an existing part, by setting down pertinent information.

Has High Strength

Among established or proven materials well known to the metallurgist are high strength cast iron, readily procurable at 45,000 pounds per square inch tensile strength, and if the need justifies, up to around 60,000, instead of the 20,000 to 30,000 that is all some design handbooks give it credit for.

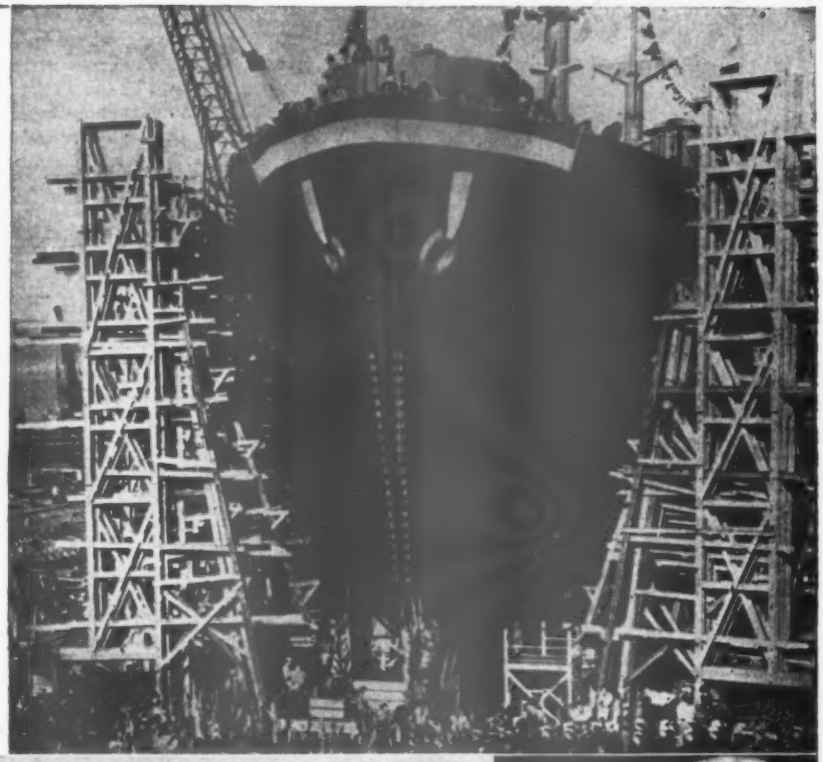
When the previously satisfactory cast iron valves for marine service prove unable to stand the shock of "near misses", the designer wishes for a shock resistant cast iron, though he usually expresses this in terms of ductility rather than what he really wants. He neglects the fact that malleable cast iron already exists, and that "quick anneal", pearlitic irons, or possibly even cupola malleable, have toughness that at least makes them candidates for consideration.[25]

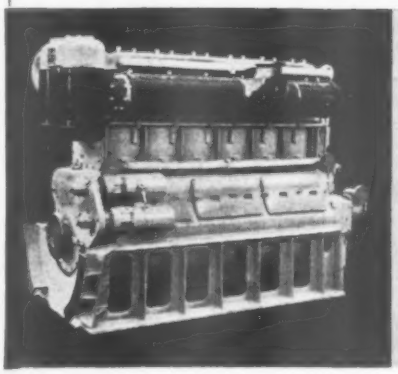
When the designer has to pay attention to the demands of the production department for machinability, he may well consider these very easily machinable malleable products, together with their stronger near relations, the Ford crankshaft and allied alloys, also the "graphitic steels" in which machinability and extreme wear resistance in some types of service, are combined with mechanical properties of the general order of other heat treatable steels. A similar combination of improved machinability without appreciable loss of mechanical properties is found in the carbon and alloy steels carrying small additions of lead.

New methods of fabrication are coming in, such as "coining" of gears cast nearly to shape, by pressing into a die that gives them their exact final form or an approach to this. Casting may replace forging, as is the case with the crankshaft of the German Juno 211 B engine for the Heinkel and Junkers planes. The willingness of German de-

(*Concluded on page* 200)

Federated Bearing Alloys Are Used In Maritime Ships





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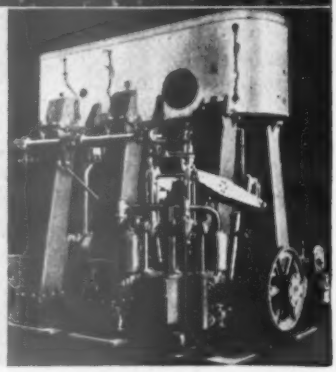

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(*Concluded from page* 198)

signers to use a cast crankshaft in a very high-power engine indicates that they have taken the lesson of the Ford crankshaft to heart. Conversely, welding together of rolled or forged pieces often replaces castings. There is continuous change in fabrication practices as the art advances.

In view of the many radical changes in fabrication methods the production engineer may well be called into conference with the design engineer, the testing engineer, and the metallurgist, so that the amenability of the candidates for consideration as alternate materials to new, convenient methods of fabrication may be discussed along with the other features entering into a choice.

It is also the task of the production engineer to guard the quality and uniformity of the product, by setting up suitable production control tests and records. A wrong process can spoil the best material.

Design, choice of materials, and processing of the materials all are connected inseparably. Each has to be done with an eye to the others, and with engineering judgment directed toward the true conditions of service. There are aids to, but no substitute for, judgment in any of the three.

When the standard or simulated service test results are in, and the metallurgical evidences needed have been adduced, there still remains the engineering responsibility of making a selection of, and writing sensible specifications for, the permissible materials.

Nothing can relieve the engineer of this responsibility, but the task may perhaps be eased and much guesswork eliminated when the engineer approaches the problem of materials from the point of view outlined in Mr. Heron's introduction, which this discussion seeks to emphasize.

One can easily sum up the principles of the selection, testing and specification of engineering metals. Good selection, good testing, and good specifications all try "to make the punishment fit the crime".

References

[24] Failure from lack of compressive strength is very rare among usual bearing alloys under proper operating conditions. Such failures usually reflect such a lack of proper lubrication as no bearing could withstand.

[25] Etchells, E. B., and A. F. Underwood. Practical Aspects of Bearing Design. I. Lubrication, *Machine Design*, Vol. 4, Sept. 1942, p. 84-87, 148.

[26] Welsh, W. P. and Wilson, W. A., A New High Temperature Fatigue Machine, *Proceedings*, American Society for Testing Materials, Vol. 41, 1941, pp. 733-745.

[27] Compare Webb, L. E.: Heat Treating NE Steels for Machinability. *Metal Progress*, Jan., 1943, p. 87-89.

[28] Compare: Substituting Malleable and High Strength Iron (for Copper-Base Alloys) *Canadian Metals and Metallurgical Industries*, May, 1943, pp. 27-28.

Vinco Corp., Detroit, designer and manufacturer of gages and precision machinery, is moving its recently-established Chicago district office to Tribune Tower, 435 North Michigan avenue on May 1.

American Brake Shoe Opens Foundry

American Brake Shoe Co. has opened a new experimental foundry at Mahwah, N. J., which for the present is concerned with problems related directly to the war effort. Although only experimental work will be done, the foundry will not be operated on a miniature basis as in the case of most pilot units, but as a full-size foundry capable of handling castings of various sizes weighing up to 2000 pounds.

While this plant had been planned as the next step in the company's program of metallurgical research, the priority situation on construction materials had postponed erection. Then it was learned that the U. S. Army Air Forces, Wright Field, Dayton, O., were concerned with the procurement of forgings for aircraft and were considering the possibility of substituting centrifugal and static castings.

Since such castings required considerable piloting before they could be ready for production, Wright Field engineers approached Brake Shoe and subsequently arranged for the Army Air Forces to sponsor a priority application. Construction was authorized by the War Production Board and a Correlation Research Project was assigned by the War Metallurgy Committee of the National Research Council.

An idle plant at Kansas City, Kans., was purchased and re-erected, adjoining the company's metallurgical laboratory. It consists of two sections, one being the experimental foundry proper, with floor area 82 x 196 feet. The other section is devoted to offices on its upper floor and to tool room, boiler room, and storage space below.

Latest type of equipment has been installed and its immediate work will be devoted to: (1) Development of pilot centrifugal and static castings practices for the aircraft industry; (2) experimental work that may be assigned by the War Metallurgy Committee; (3) research projects that have a bearing on the war for the eight operating divisions of the American Brake Shoe Co. and (4) after the war the principal activity will be the experimental and research work, including investigation of new processes or products.

Steps for Postwar Planning Listed

Steps which may be taken by industrial employers in planning for high postwar levels of production and employment are set forth in detail in a handbook, "Planning the Future of Your Business," prepared for the Committee for Economic Development by a special committee of the Association of Consulting Management Engineers. The handbook is obtainable only through the local Committees for Economic Development now organized in more than 1400 communities in all parts of the country.

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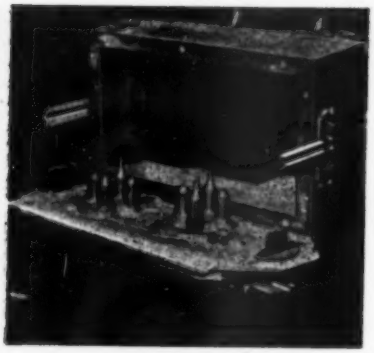

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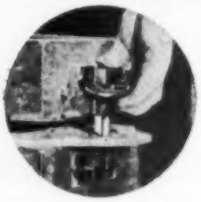

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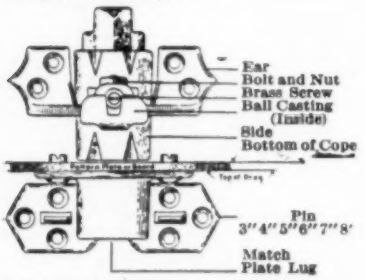

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FLEXIBLE TUBING—A new 36-page illustrated engineering manual (SS 44) on stainless steel flexible tubing and bellows has been issued by Chicago Metal Hose Corp., Maywood, Ill. Tables of sizes, weights, wall thickness are shown, also pressure data, minimum bending radii and other detail useful to the engineer. Data on fittings include diagrams and instructions for attaching them, also recommended design procedure for various types of applications.

NITRIDING—A 19-page publication, Catalog T-624, recently revised and reissued by the Leeds & Northrop Co., 4934 Stenton Ave., Philadelphia and available upon request, describes the Homo nitriding method, said to give heat treaters precise control of the three important variables: Nitriding temperature, flow and distribution of ammonia gas, and duration of treatment.

ARC WELDING — A 12-page illustrated booklet, "Four Ways To Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding," published by C. E. Phillips & Co., 2750 Poplar Street, Detroit, discusses the inherent difficulties encountered in welding cast iron. Four types of electrodes are described. Characteristics and best welding procedure for each are explained.

HEAT TREATING SALTS — A four-page folder issued by the research department, G. S. Rogers & Co., 228 North La Salle Street, Chicago, presents brief comment on the many heating and special purpose jobs where molten salts can be used profitably. A conveniently arranged table shows the application, specification number, melting point and working range for heating, drawing and tempering, annealing, aluminum heat treatment, brazing, stainless steel, coloring, high speed hardening, and quenching. A second similar folder deals with liquid bath carburizers.

SERVICE BULLETIN—A data sheet in the form of a regular file folder for convenient filing and ready reference, issued by the Claud S. Gordon Co., 3000 South Wallace Street, Chicago, includes detailed instructions in the use of pressed steel pots, new box type laboratory furnaces, furnace atmosphere indicator, lead wire.

MANGANESE STEEL — A 30-page bulletin, No. 1243-CP, issued by the American Brake Shoe Co., American Manganese Steel Division, Chicago Heights, Ill., describes the use and application of manganese steel in the clay products industry. Items covered include: Clay working machine parts, crusher parts, de-airing machine parts, dippers, gears and pinions, properties of manganese steel, metallurgical research laboratory, muller parts, muller tires, pug mill parts, pulverizer hammers, screen plates, shale planer parts, sheaves, welding materials, what is manganese steel, wheels, x-ray laboratory.

STEEL CUTTING — A vest pocket hand guide to top performance in steel cutting with carbides, Manual GT-166 issued by Carboloy Co., Inc., Detroit, 32, Mich., covers the characteristics of different grades of carbides designed for steel cutting, selection of proper rake and relief angles, size of radius, feeds and speeds, etc.

LOCOMOTIVES—A new 68 page booklet issued by the H. K. Porter Co., Inc., Pittsburgh presents technical data on a complete line of industrial and railroad switching locomotives. More than 50 locomotive types are illustrated with complete specifications and performance data in the majority of cases. Articles on standard specifications, tractive force and the most modern procedures in locomotive operation are illustrated with mechanical drawings and tables.

PROTECTION—Head-to-foot protection for industrial workers, including gloves, boots, aprons, respirators, finger guards, acid containers, rubber clothing, welder's equipment, is the subject of a brochure recently issued by Dunn Products, 329 South Wood Street, Chicago. Compilers of the booklet claim to have endeavored to describe each item fully and accurately to enable the reader to select quickly any particular item. Hints also are presented on how to select and take care of gloves or other pieces of equipment.

PUMPS—A booklet recently issued by the Chain Belt Co., Milwaukee, describes and illustrates a line of centrifugal pumps ranging in capacity from 3000 to 125,000 gallons per hour. The smallest size can be shifted by hand, while the larger sizes are mounted on wheels. Details of construction and materials are presented. Additional information includes how to figure the right pump for the job, table of water friction, practical suction lifts for various altitudes, water friction in elbows, pressure conversion tables, etc.

ANNIVERSARY—A 32-page booklet issued by the Penn Metal Corp., of Penna., Oregon Avenue and Swanson Street, Philadelphia, commemorates the founding of the company 75 years ago and the inventive genius of the founder, Longley Lewis Sagendorph. History of the company is traced and interwoven with significant industrial and political events from 1879 to 1907.

TRUCKS—To acquaint industry with its war standardized line of electric industrial trucks, the Yale & Towne Mfg. Co., Philadelphia, has published a 76-page catalog containing a description of all models and illustrations of applications. A separate section is devoted to the WPB limitation order No. L-112 as it applies to industrial trucks produced by that company.

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CHAPTER VII
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CHAPTER VIII
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CHAPTER IX
Applicable Tests and Needed Tests

CHAPTER X
Selection

BIBLIOGRAPHY

APPENDIX
Reference Books

INDEX

HERE is an outstanding contribution to available literature in the field of metallurgy. This report, prepared for the War Metallurgy Committee, provides both the engineer and the metallurgist with the basis for a better understanding of each other's problems and proficiencies. Such well-known men in the field of metallurgy as Zay Jeffries, P. D. Merica, John Johnston, R. F. Mehl, J. H. Critchett, G. F. Jenks, V. N. Krivobok, J. B. Macauley, J. L. Gregg, S. Epstein, Val Cronstedt, F. R. Shanley, and members of the Battelle Memorial Institute staff actively collaborated with Doctor Gillett in drafting and revising the report. It should be in the hands of all engineers and production men responsible for the selection or specification of engineering materials.

It was published exclusively in the magazine STEEL over a period of 12 weeks and has created a tremendous amount of interest throughout the metalworking industries. Abstracts also appeared in *Machine Design* and *The Foundry*.

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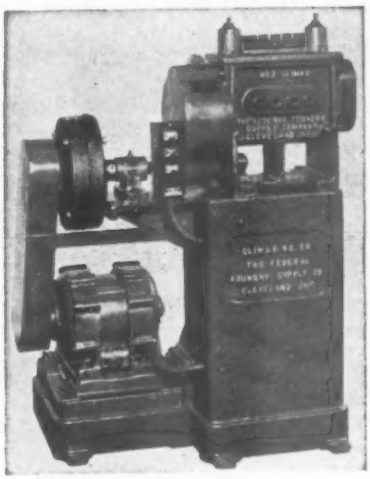

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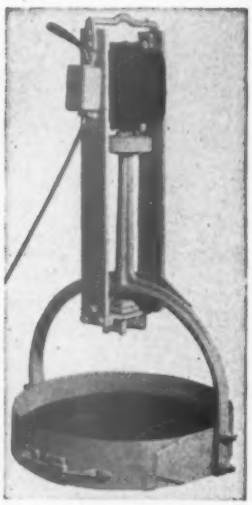

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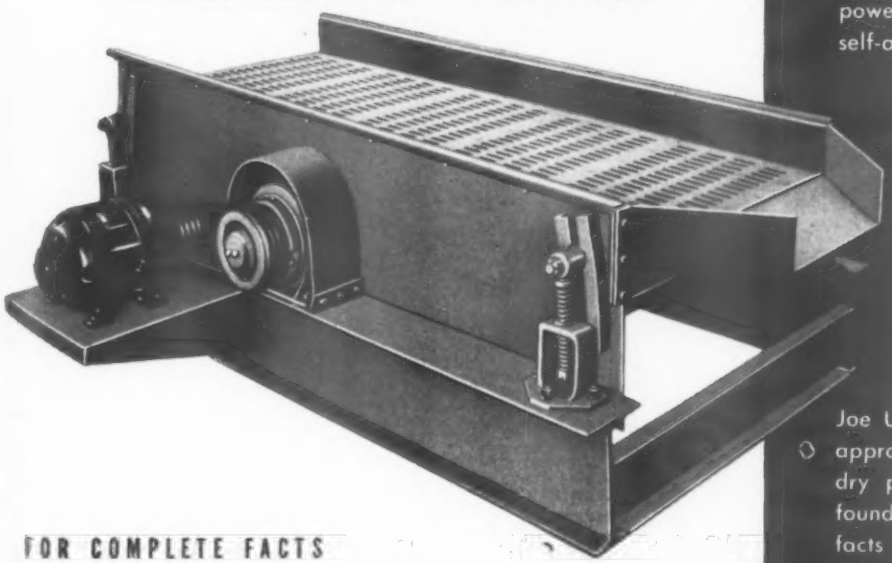

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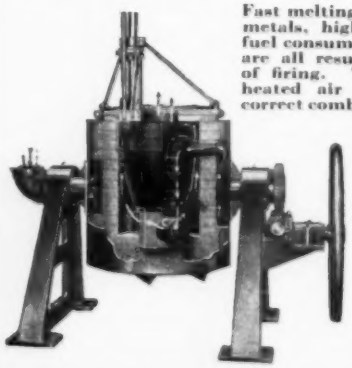

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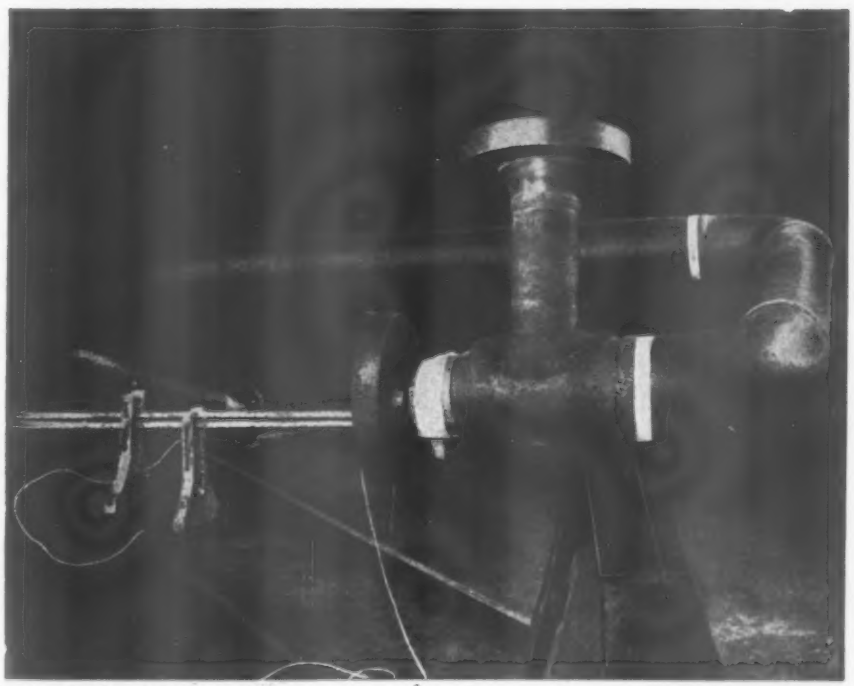

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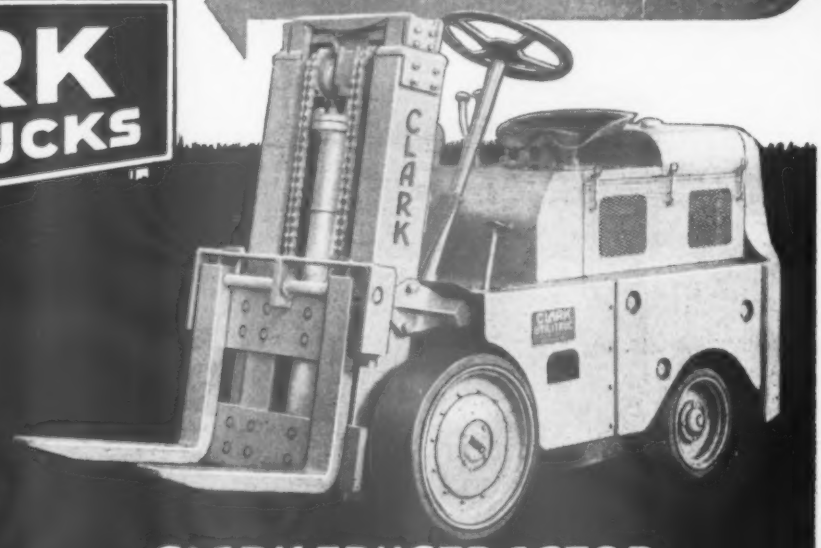

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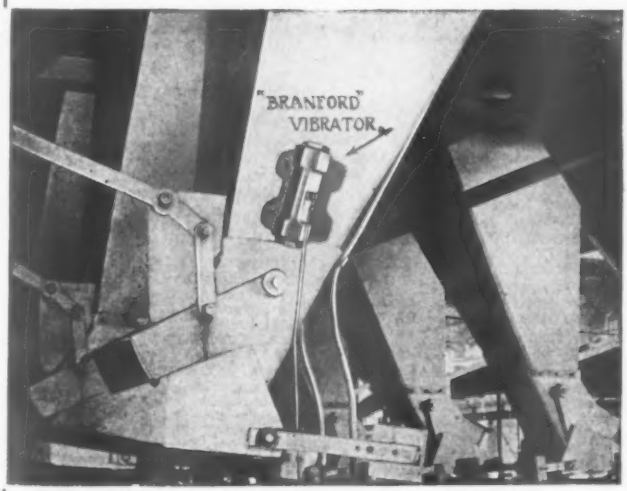

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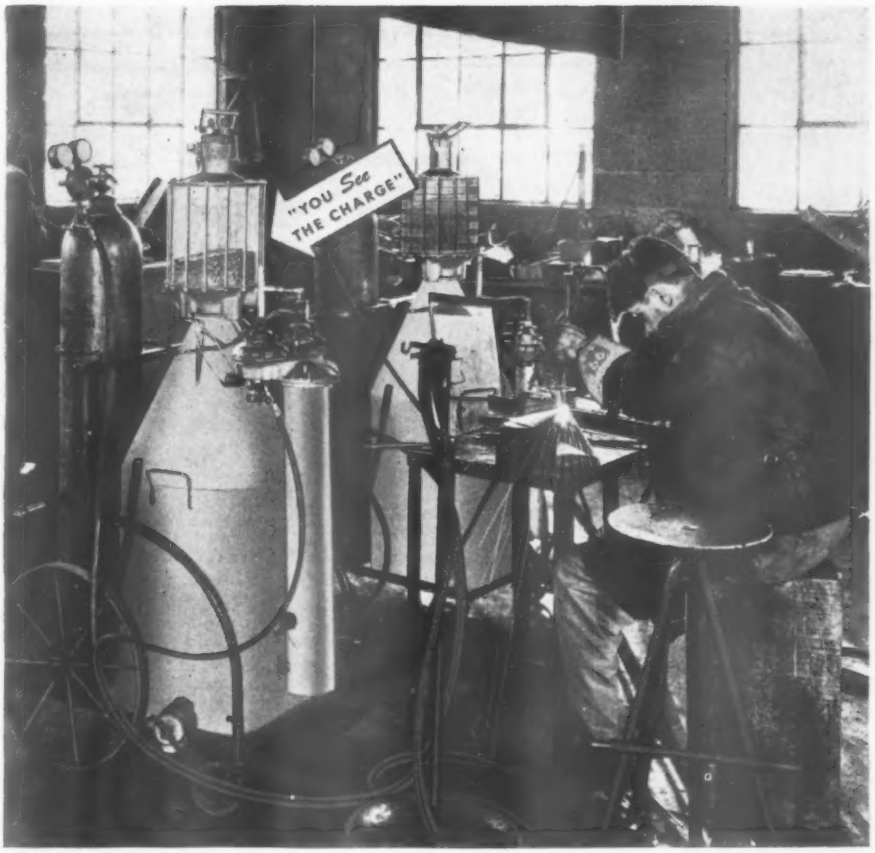

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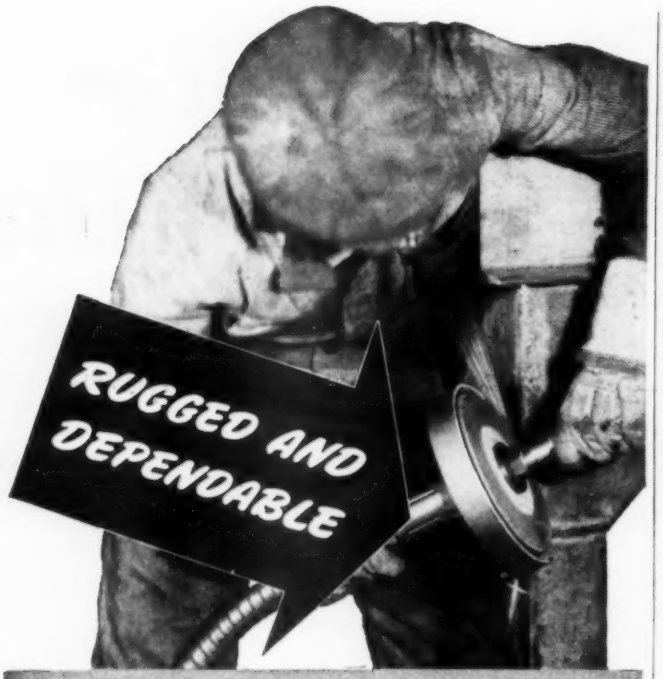

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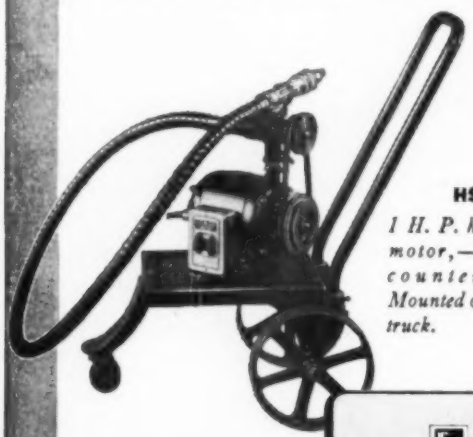

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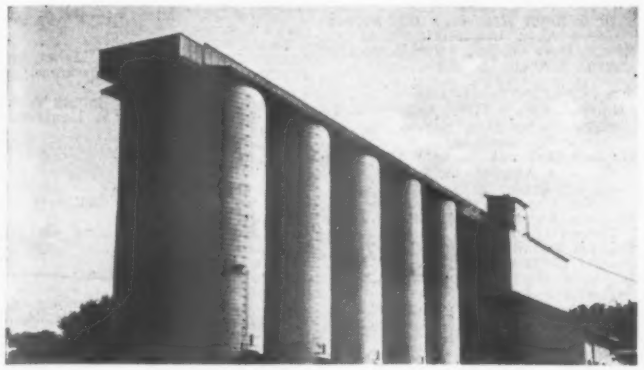

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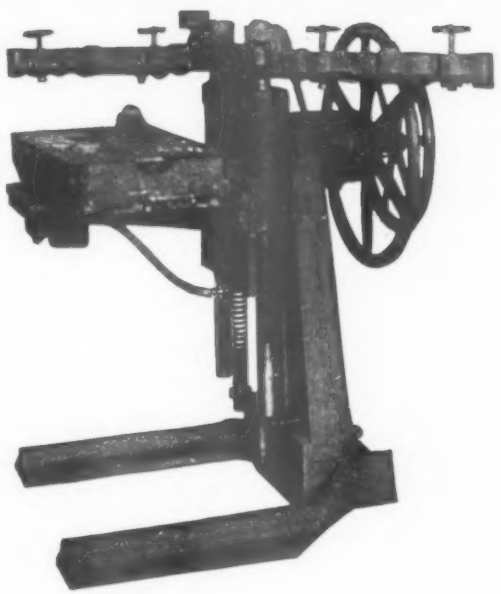

The machine illustrated is the Model C-414 in pattern drawn position. Capacity of flasks 36 x 46. This machine is being widely used for the accelerated magnesium castings production.

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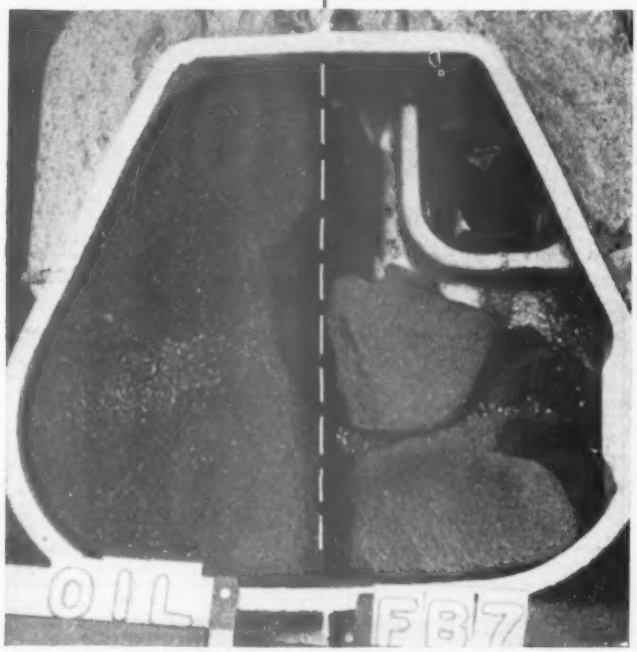

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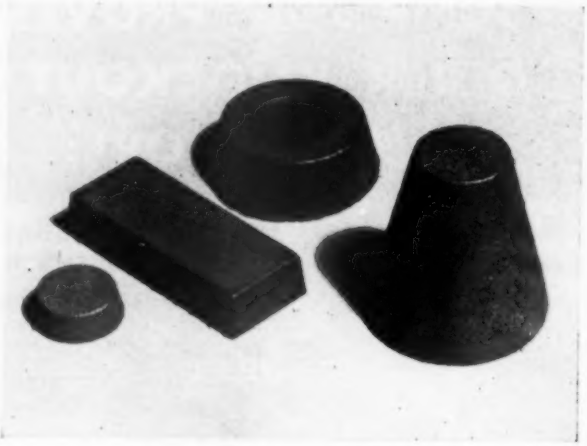

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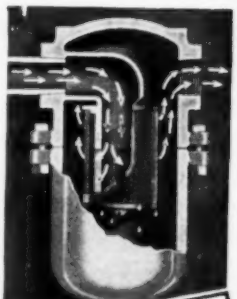

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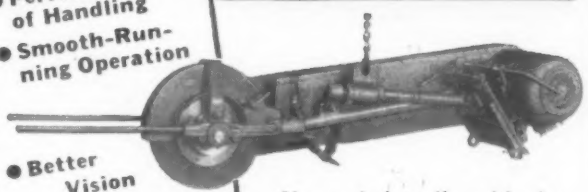

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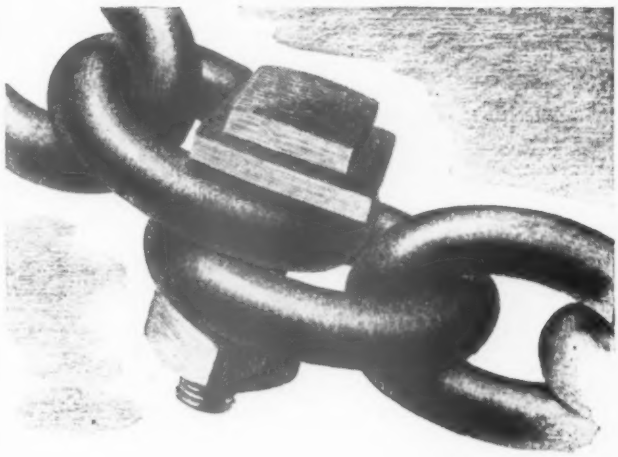

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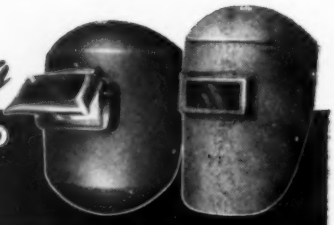

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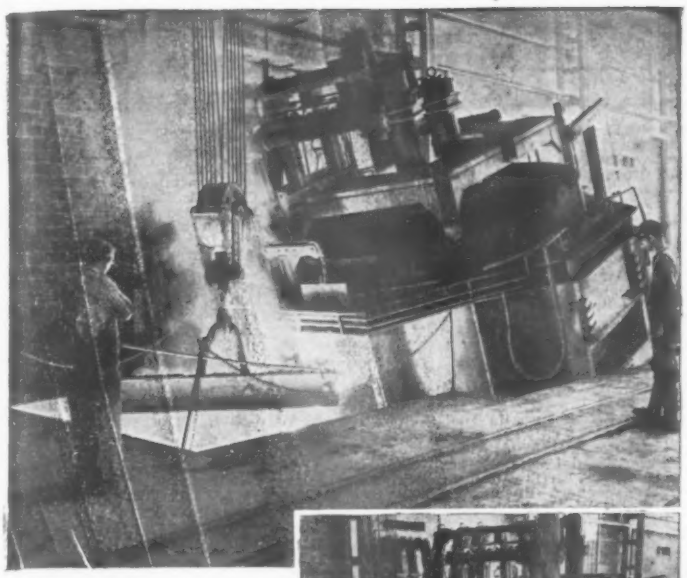

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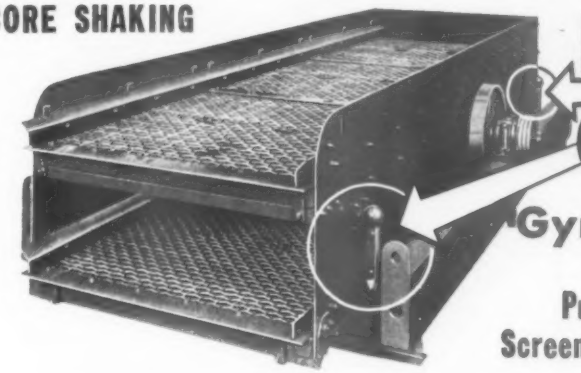

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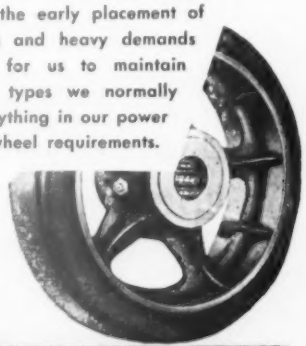

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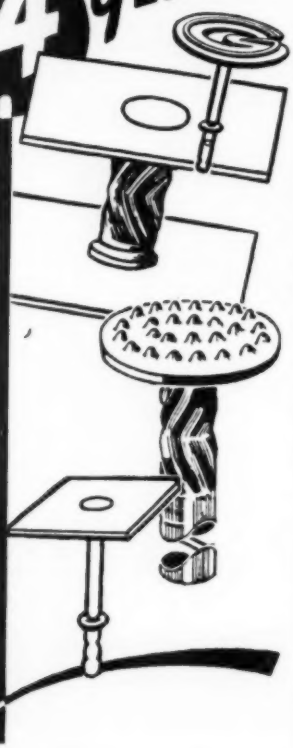

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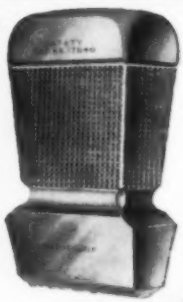

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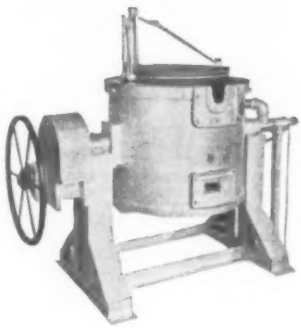

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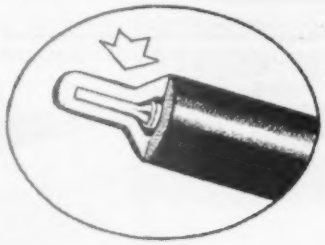

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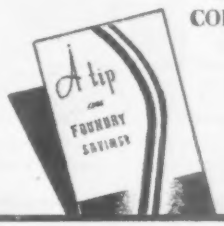

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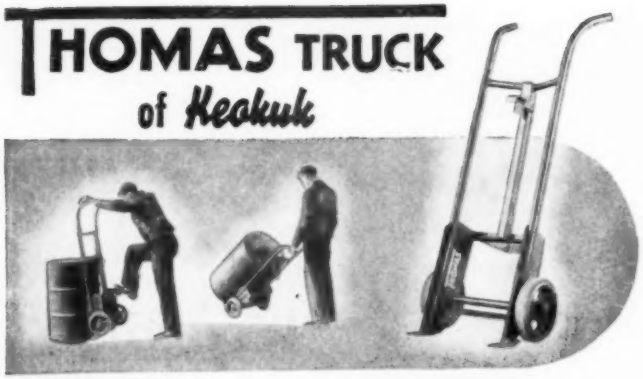

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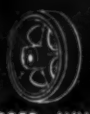

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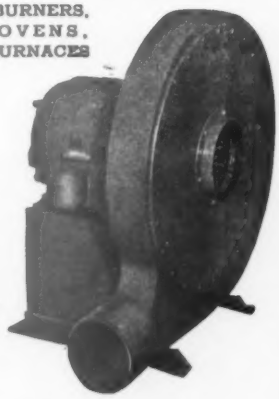

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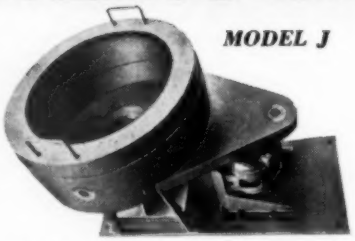

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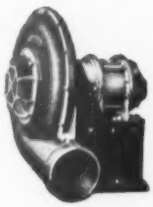

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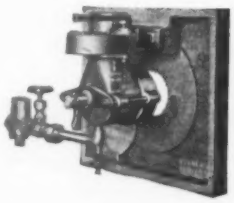

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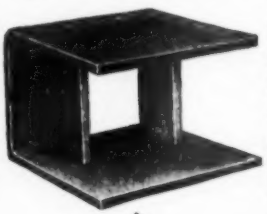

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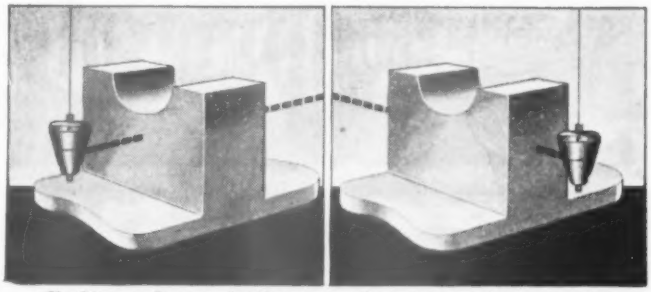

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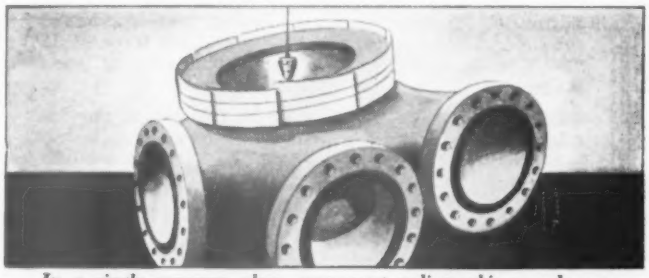

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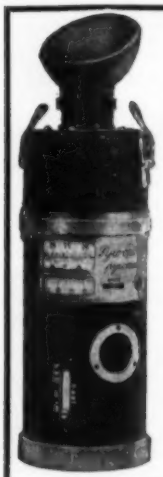

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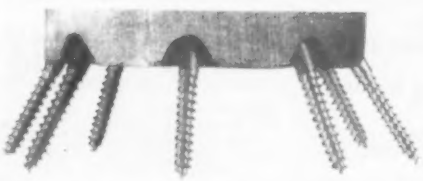

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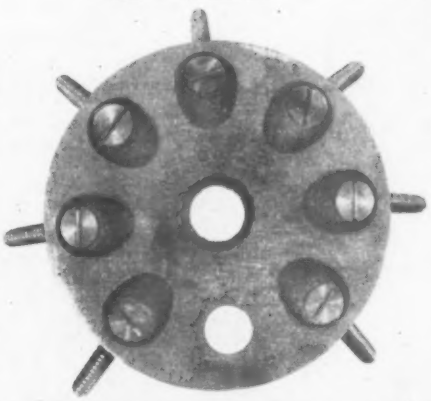

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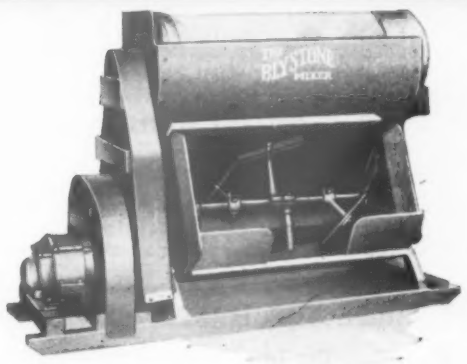

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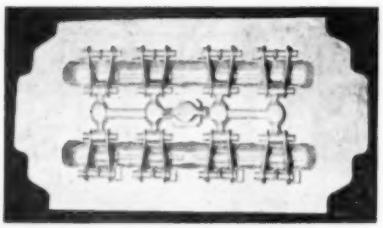

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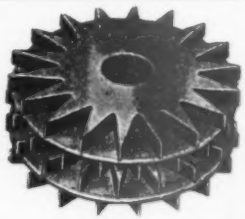

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In spite of this, it is surprising how many nozzles exceed their guarantees by substantial margins—thus bringing greater economy and service to their pleased owners—and increased recognition and popularity to themselves.

*Trade-mark of Norton Co. for Boron Carbide

PANGBORN CORPORATION
The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment
HAGERSTOWN . . . . MARYLAND

FAMOUS FOR
RUGGEDNESS

The burly, brawny strength of oxen brought our pioneer fathers across America. It is the same strength that typifies Truscon Foundry Flasks—the same ability to keep going, day after day, despite long schedules of heavy production.

Truscon Foundry Flask design service and manufacturing ability, can meet your needs for regular or special foundry flask service. Write for illustrated catalog giving Truscon Foundry Flask details and tell us your problems.

Correct thickness of flask walls..proper placing of flanges ...types of handles and pin lugs... these features assure quick, economical, long-life production in your plant.

TRUSCON FOUNDRY FLASKS

TRUSCON STEEL CO., Pressed Steel Division • 6100 Truscon Ave., Cleveland, Ohio • Subsidiary of Republic Steel Corporation

CORE WIRE
STRAIGHTENED AND CUT TO SIZE
Write for Descriptive Circular
PROGRESSIVE CORE WIRE CO.
1825 Bronson Court S. E. Cleveland 15, Ohio

Employee Identification Badges
Tool Checks—Time Checks
Plastic Cases for Work Cards
ST. LOUIS BUTTON COMPANY
50 YEARS OF SERVICE
415 LUCAS AVE. ST. LOUIS (2), MO.

CHAMPION EMERY WHEEL DRESSERS
A Type and Size for Every Wheel

Made of special material —processed and heat treated—runs in oil bearing. *Send for details and prices.*
WESTERN TOOL & MFG. CO., Springfield, Ohio

GREENE ELECTRIC STEEL MELTING FURNACES
Lower-Power,—Medium Priced Furnaces for highest quality steel; and Fastest Melting Types for tonnage; but Quality often makes up for speed.
GREENE ELECTRIC FURNACE CO.
2702 6th South, Seattle 4, Washington

IMMEDIATE DELIVERY
FROM OUR NEW AND INCREASED WAREHOUSE STOCKS
Molding Sands, Foundry Supplies and Equipment for Every Purpose!
MIDWEST FOUNDRY SUPPLY CO.
EDWARDSVILLE, ILLINOIS
St. Louis Tele.: REpublic 5097 *Edwardsville Office, 76*

Classified Advertising

Help Wanted

Old established firm

making and machining STEEL CASTINGS for over 35 years, offers

SPLENDID OPPORTUNITY IN STEEL FOUNDRIES and MACHINE SHOPS

located in Ohio—

SKILLED or **UNSKILLED** men over draft age or not subject to induction, needed in all departments including—

MELTING DEPARTMENT (ELECTRIC FURNACES)
MOLDING DEPARTMENT
CLEANING ROOM
ROLL DEPARTMENT (MAKING AND MACHINING IRON AND STEEL ROLLS)
PATTERN SHOP (PATTERN MAKERS AND CHECKERS)
HEAT TREATING DEPARTMENT
LABORATORY (CHEMISTS)
IRON ROLL DEPARTMENT (SUPERVISOR)
ALSO SUPERVISORS FOR ALL DEPARTMENTS

Write or apply to—

THE OHIO STEEL FOUNDRY COMPANY

LIMA, OHIO or SPRINGFIELD, OHIO

MUST COMPLY WITH W.M.C.

TIME STUDY

EXCELLENT OPPORTUNITY

IN EASTERN FOUNDRY

FOR MAN WELL TRAINED

Give complete record of education and experience during last ten years. State age, marriage and draft status, salary expected, and how soon available.

BOX 390

The FOUNDRY CLEVELAND 13, OHIO

WANTED

Experienced grey-iron and non-ferrous Foundry Manager. Must understand Cost, Planning, Scheduling and Production Methods.

BOX 469

THE FOUNDRY CLEVELAND 13, OHIO

METALLURGIST

With Gray Iron experience and knowledge of cupola and foundry practice. Position of responsibility. Production shop. Excellent post-war opportunity. Please give complete information in reply. Address: Box 456, The FOUNDRY, Cleveland 13, Ohio.

MAGNESIUM FOUNDRY SUPERINTENDENT

Ohio manufacturer of Magnesium Sand Castings for Aircraft has an immediate opening for an experienced magnesium or nonferrous Foundry Superintendent. Good salary. Reply stating age and experience. Replies will be held in strict confidence. Our organization knows of this advertisement.

BOX 300

The FOUNDRY CLEVELAND 13, OHIO

STEEL FOUNDRY FOREMAN

EXPERIENCED ON LIGHT STEEL CASTINGS. ELECTRIC FURNACE PRODUCTION. 500 TONS PER MONTH. A REAL OPPORTUNITY TO THE RIGHT MAN. LOCATED IN NORTHERN OHIO. ADDRESS: BOX 463, THE FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRY FOREMAN

Open Hearth Steel Foundry production large and medium steel castings want a foundry foreman. Must be familiar with piece work methods and have both green and dry operations experience. State age, qualifications, salary expected and when available. Address: Box 422, The FOUNDRY, Cleveland 13, Ohio.

COREROOM FOREMAN

For Open Hearth Steel Foundry specializing in medium and large steel castings. Applicant must be able to set piece work rates and understand core-sand mixes thoroughly. State age, qualifications, salary and when available. Address: Box 421, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Steel and gray iron molders
Union shop

N. & S. FOUNDRY COMPANY,
SEATTLE, WASH.

FOUNDRY ENGINEER

Permanent mold and die designing experience. Address: Box 402, The FOUNDRY, Cleveland 13, Ohio.

ENGINEER (Designing)

A Mechanical Engineer with foundry experience to create, completely design and supervise experimental work of molding machines and other foundry equipment. Address: Box 448, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY INSPECTION SUPERVISOR

Large N. Y. Metropolitan manufacturer of aircraft accessories requires inspection supervisor with experience in nonferrous foundry work. Good knowledge of casting layout and machine shop operations essential. Excellent opportunity. Please state details including draft status and salary expected. Address: Box 931, Realservice, 110 West 34th St., New York City.

FOUNDRY MANAGER

Good executive with experience in jobbing casting business. Good position for right man. Give training, experience and salary required. Address: Box 460, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

N. Y. Metropolitan manufacturer of nonferrous aircraft accessories requires assistant to metallurgical supervisor. Experience with aluminum and magnesium castings essential. Excellent opportunity to learn sand, permanent mold and die casting. Please give details including draft status and salary expected. Address: Box 932, Realservice, 110 West 34th St., New York City.

EXPERIENCED METALLURGIST

Nonferrous foundry wants experienced metallurgist to take over laboratory with X-ray department. Give full information as to experience and references in your reply.

BOX 454

THE FOUNDRY CLEVELAND 13, OHIO

ALUMINUM FOUNDRY SUPERINTENDENT

Large midwest aluminum foundry making aircraft aluminum alloy castings has an opportunity for an aggressive, experienced man. Must know how to obtain, on a production basis, castings that meet required metallurgical, x-ray and physical specifications, aided by laboratory controlled process specifications. Experience in handling of men is of course essential. Established business assures an excellent postwar opportunity for a man who can make good. Give personal data, experience, and salary expected in your reply. Address: Box 467, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Must have practical experience in cupola operation and practical foundry experience. Good position for right man. Address: Box 461, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Ferrous, nonferrous foundry superintendent, technically fully capable, good organizer, permanent position. Address: Box 459, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

An old established Ohio gray iron foundry wishes a man knowing foundry operations from core room, foundry, to shipping room, supervision of men, production layout, cost and molding time and well versed in green and dry sand work. State chronologically present and past connections, length of time in gray iron foundries, age, expected salary. Address: Box 466, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Help Wanted

FOUNDRY FOREMEN

A real opportunity with a well-known old established gray iron foundry. Permanent job during post-war period with considerable work ahead. Must have experience in machine molding and supervision of men. State chronologically, last connections, salary expected, age. Address: Box 465, The FOUNDRY, Cleveland 13, Ohio.

REPRESENTATIVES WANTED

Well-known manufacturer of high grade line of plumbago, facings, parting, blacking, core wash and allied foundry items wishes to obtain additional representation by salesmen now calling on foundries regularly. Liberal commission basis. Please advise territory covered, lines now handled, experience with foundry items, etc. Address Box 217, The FOUNDRY, Cleveland.

ASSISTANT SUPERINTENDENT

For a Jobbing Malleable Iron Foundry located in the central west. Should have Pattern Shop experience and demonstrated ability in a medium size plant. State age, experience, education and salary expected, with references. Capable of estimating molding time and costs on inquiries. Write us in detail giving complete story of exact work with various companies. Address: Box 395, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY MANAGER

Must have had considerable experience in actual molding. Also with continuous molding and pouring operations. Middle West. Address: Box 471, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Assistant Superintendent Gray Iron Foundry-man who knows foundry and good at handling men. Superintendent not well and needs help until retirement. We employ six green sand moulders and room for more. Also melt brass and aluminum. Give experience, salary expected and references. Address: Box 468, The FOUNDRY, Cleveland 13, Ohio.

SALES ENGINEERS AND TRAINEES

Progressive Chicago company desires men with technical background for alloy metal sales and service. Definite post war possibilities. Address: Box 455, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISORS

Large mechanized foundry located in Detroit area, specializing in automotive castings, has position available for thoroughly qualified men—not over fifty (50). Must have Core Room, Pattern Shop or Molding experience. Address: Box 452, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY FOREMAN

To take charge of molding and melting. Capacity 250 tons. State experience and salary wanted. Address: Box 451, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Experienced Brass foundry foreman. Address: Box 477, The FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY FOREMAN

Good on rigging, gating and risering. Must be well versed on modern sand practice and all-round foundryman. Address: Box 470, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

For medium jobbing foundry in western Michigan, producing light and heavy machinery and alloyed gray iron castings. Must be practical in molding and coremaking and qualified to teach and handle men. State age, references and salary expected. Address: Box 478, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT OR ASSISTANT

Capable grey iron foundryman experienced in all departments of light to medium grey iron. Reliable with twenty years of jobbing background. Address: Box 475, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY SUPERINTENDENT OR MANAGER

Practical man. Well versed in all brands of the trade, jobbing and production. Large and small castings, green or dry work. Can figure and estimate from blue prints. Authority on metals and practice. 43 years old, married, good character wishes to make connection with company with a future. East Coast Metropolitan area preferred. Address: Box 474, The FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER OR SUPERINTENDENT

Mechanical Engineer, middle age, proven ability in top management. Familiar with modern foundry equipment and methods. Can handle all details connected with ferrous and nonferrous work. Desire to change to position with definite postwar future. Locate anywhere. Address: Box 462, The FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER OR SUPERINTENDENT

Married, thirty-nine years of age, wife and two children, desires position with post war possibilities. Has background of twenty years' experience in gray iron. Well versed in all phases of the business both green and dry sand work. Can furnish excellent references. Prefer locating in New York, Ohio or Indiana. Address: Box 304, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

A practical gray iron foundryman of 40 years' experience producing quality castings, well versed in green and dry sand molding machines, rigging for production, cupola, cores etc. Have run successfully some of the best foundries in the United States. Am available at once. Prefer Pacific Coast. Address: Box 450, The Foundry, Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Broad practical experience including steam valves, high pressure castings, chilled castings and general jobbing and production work. Prefer position with manufacturing plant. Address: Box 160, The FOUNDRY, Cleveland 13, Ohio.

STOVE PLATE FOUNDRY SUPERINTENDENT

Desires position with a well established stove concern. Available June 1, 1944. Excellent past record—coremaking—pricing—handling personnel and general foundry practice. Address: Box 458, The FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY WORKS OR GENERAL MANAGER

TECHNICAL MAN WITH SHOP AND ADMINISTRATIVE EXPERIENCE IS AVAILABLE ON SHORT NOTICE. ADDRESS: BOX 373, The FOUNDRY, CLEVELAND 13, OHIO.

GENERAL MANAGER—SALES EXECUTIVE

With valuable experience in managing, building up and maintaining foundry and machinery business on profitable basis, invites correspondence preliminary to interview. Ability to direct all office, sales, financial and production activities efficiently and economically unquestionably established by previous record. Address: Box 441, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Desires high grade position with definite post-war possibilities. Over fifteen years control and research experience in ferrous and nonferrous fields, cast predominantly. Supervisory experience qualifies to head department. Midwest. Non-draft age. Address: Box 464, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SALES ENGINEER-EXECUTIVE

DESIRES POSITION WITH FOUNDRY MANUFACTURING MALLEABLE AND GREY IRON CASTINGS ON PRODUCTION BASIS TO TAKE COMPLETE CHARGE OF SALES. TWENTY-FIVE YEARS' EXPERIENCE IN THE MANUFACTURE AND SALE OF CASTINGS, METALLURGIST, PRACTICAL AND TECHNICAL FOUNDRY TRAINING. MIDDLE AGE, MARRIED AND CAN FURNISH BEST OF REFERENCES. EMPLOYED AT PRESENT. LOCATION ANYWHERE. ADDRESS: BOX 416, THE FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRY SUPERINTENDENT OR GENERAL FOREMAN

Foundry superintendent now employed desires to make change. Twenty-six years' executive experience in grey-iron and semi-steel. Practical man on green and dry sand, medium and heavy, well versed on high tensile metals and cupola practice. Address: Box 382, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY MANAGER

Foreman 38, wants position in jobbing foundry with post war future. Twenty years' foundry experience, eight as foreman. Practical molder and coremaker, technically trained. Successful record on monel, nickel, copper, aluminum, manganese and silicon bronzes. Do own alloying. Address: Box 481, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER OR SUPERINTENDENT

Over 30 years' experience in production of all kinds of grey iron castings as foreman, superintendent and manager. Practical in every detail of foundry operation. Both hand molding and all types of machine molding. Address: Box 472, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY INSTRUCTOR

A man with over 35 years' experience in foundries as foundry superintendent has devoted 2½ years to successfully teaching unskilled labor to produce saleable castings. If you can use such service, address: Box 473, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

One tilting crucible furnace—No. 200-250 Crucible—gas fired—to melt aluminum. Address: Box 479, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Used 250 or 500 lb. per hour electric melting furnace with or without electrical controls. Address: Box 480, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

Owner of nonferrous foundry, 100% war production, with postwar contracts, offers fine opportunity to Industrious A-1 Foundry man with capital to invest in ¼ interest in $300,000 per year concern in lively community. Building owned by Operator with room for expansion. First class references required. Address: Box 453, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MACHINE SHOP

Southern Ohio; same owner 43 years; brick building 35 x 112; fully equipped iron-brass-aluminum; small machine-pattern shop; well equipped; on railroad; sell with property. Address: APPLE COMPANY BROKERS, CLEVELAND, OHIO.

Foundry time study and methods engineer seeks opportunity to install incentive plan in nonferrous foundry now operating on day work basis. Would form and supervise standards department, select and train personnel. Address: Box 476, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Employment Service

SALARIED POSITIONS

This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY INC.
101 Delward Bldg. Buffalo, N. Y.

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge.

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

Foundry For Sale

FOR SALE

In West Coast area, well equipped nonferrous Foundry and wood and metal Pattern Shop. Accommodates 35 or more employees. Doing excellent business, established over 24 years. Owner wants to retire. Approximate price $100,000.00. Address: Box 424, The FOUNDRY. Cleveland 13, Ohio.

For Sale

SPECIAL DEFENSE BARGAINS

Cast Iron and Steel Plate Mill-Dust & Shavings Exhausters 50 in stock. **Cupola and Furnace** Blowers for Coke, Oil or Gas Combustion.
1—Spencer blower 3600 CFM @ 1½ lbs.—40 h.p. motor, and blast gate. 3/60/220 or 440.
1—Spencer Blower 2250 C.F.M.—1½ lbs.—25 H.P. 3/60/220 or 440 AC.
2—Sprague 4 Ton Electric Hoists 115 V. D.C.
1—Sprague 2 Ton Electric Hoist 115 V.—D.C.
Furnaces:
1—US Rotary No. 3—Melting or Smelting.
1—Pair Monarch-Rockwell's—Rotating, each 500 lbs. cap. mounted together on base, oil burners available, when used together waste heat from one preheats other.
1—Hausfeld open flame, non crucible 400 lbs. brass capacity or equivalent volume for Aluminum.
1—Stationary for No. 70 crucible.
1—Schwartz, size 42" class A—for oil fuel.
Tumbling Mills—2 cast iron for brass cleaning.
1—Sly 48" x 60"—1" thick round steel shell.
2—36" dia. x 60" round steel shell.
Core Ovens:
1 each—"Buckeye" and "Hill & Griffith" portable semicircular styles 5 shelves each.
1—Core Sand Mixer, Triumph make (dough mixer type) approx. 5 cu. ft. cap. 3—H.P. motor geared direct, 3/60/220 A.C.
Molding Machines:
1—Battenfeld stationary 17" x 22" platen—jolt-squeeze.
2—Osborn Portable No. 75-J.
2—Osborn Portable No. 76 air squeeze only.
1—Arcade portable or stationary plain air squeeze.
1—Stationary small jolt table for cores.
1—Tabor jolt Table No. B-18 54" x 96".
1—Jolt Table 12" cyl. 40" x 60" table.
1—Jolt Table 16" cyl. 42" x 60" table.
1—Osborn No. 405 stationary jolt-rollover draw.
Compressors:
1—Chicago 7½" x 6" 106' capacity, 100 lbs.
1—Chicago 12" x 8" 240' cap., 70 lbs.
1—Worthington Feather Valve 150' cap., 100 lbs.
1—Chicago—8" x 8"—Horizontal, 128'—100 lbs.
1—Chicago—6" x 6"—50' cap.
1—Worthington 2 stage 450' cap.
Gardner 4½" x 4½" Vertical 19'.
Tested-air receivers—12" up to 36" dia.

CLIFTON MACHINERY CO.
1023 W. 6TH, CINCINNATI 3, OHIO

REBUILT
BLOWERS—FANS—EXHAUSTERS

Roots-Connersville positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder end dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY
406 N. Peoria St. Chicago, Ill.

For Sale

REBUILT USED EQUIPMENT

Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers; sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1234 Lake St. Kalamazoo, Mich.

FOUNDRY SAND HANDLING EQUIPMENT

We offer prior to sale—F.O.B. Bridgeport, Conn., the following—

1 Paddle Mixer consisting of motor and gear drive unit. Mixer can be used for the purpose of continuously mixing and tempering molding sand at the rate of 35 tons per hour when fed regularly and continuously.

1 Leadproof Apron Feeder. Feeder is 19 ft. centers; operates a speed of 20 F.P.M.; has a capacity approximately 35 tons per hour of shakeout sand. Equipment originally purchased from the Jeffrey Mfg. Co., Columbus, Ohio. In first class condition.

5 Tabor Molding Machines.

3 Bridgeport Pneumatic Molding Machines with vibrators. Further information can be furnished upon request.

JENKINS BROS.
510 MAIN ST. BRIDGEPORT, CONN.

COMPRESSORS AND BLOWERS

2100 cfm @ 12 oz. Gen. Elec. Centrifugal compressor with 10 HP 2-60-3450 RPM motor.
2—1200 cfm @ 11 oz. Buffalo Pressure Blowers, 9½" intake 7" x 7¼" outlet, with 7½ HP 3-60-1800 RPM motors.

SAND VIBRATOR

7 to 8 ton per hours, Jeffery-Traylor with vibrator M.G. set. Write, wire or phone.

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE., CLEVELAND 14, OHIO

FOR SALE

DETROIT ROCKER ELECTRIC FURNACE 60 Cycle, 4800 Volt Input to Transformer, 175 KW, 750 lbs. capacity.
Transformer, high voltage Kelman Electric Switch, new Buss Bars and Cables, automatic controls, one extra furnace shell included, all in good working conditions.

CAST METAL SPECIALTIES
3474 Union Pacific Ave., Los Angeles 23, Calif.

FOR SALE

1—3-ton Geared Ladle.
1—8-ton Geared Ladle.
1—Whiting Standard Mixing Ladle 18" radius x 64" long—excellent condition.

BAKER PERKINS INC.
Saginaw -:- Michigan

FOR SALE

20 ton ladle worm and gear type, geared both sides. Address: Builders Iron Foundry, Providence 1, R. I.

FOR SALE

Model 50 Beardsley & Piper Speedmuller Capacity 8 cu. ft. with skip hoist. Address: Elyria Belting & Machine Co., P. O. Box 5, Elyria, Ohio.

FOR SALE

Foundry and Machine Shop. Capacity 25 men. Address: The Geo. S. Anderson Co., 425 Watt St., Jeffersonville, Ind.

FOR SALE

One 36" square by 5' long Tumbling Mill—¾" Plate Sides and 1" Plate Ends. Has been completely rebuilt and is in first class condition. Address: PREMIER FURNACE COMPANY, DOWAGIAC, MICH.

For Sale

REBUILT EQUIPMENT IN STOCK
IMMEDIATE SHIPMENT

(1)—3-ton geared crane type Ladle.
(2)—¾" cap. Power Sprue Cutters.
(1)—10" Tabor Post Type Squeezer.

ELECTRIC MONORAIL HOISTS

(2)—1-ton Shepard, 230-VDC., 1-motor.
(2)—1-ton Euclid, 115/230-VDC., 1-motor.
(1)—1-ton Cleveland Tram, 230-VDC., 2-motor.
(1)—2-ton Shepard, 230-VDC., 1-motor.
(1)—2-ton Shepard, 230-VDC., 2-motor.
(1)—5-ton Detroit, 230-VDC., 1-motor.
SPECIAL: 2—1-ton Shepard Hoists arranged for stationary mounting, 7½-HP. motor, 220/440-VAC., Var. Speed, separate controller, cap. 32-ft. of cable, suitable for use as winches, car puller, to operate furnace doors or elevator.
SPECIAL: 2—7½-ton Shepards fl. or cage operated, 230-VDC., 20-HP. hoist motor, 28/70-FPM., 10-HP. trolley motor, 350/400-FPM., 40-ft. lift.

BUCKETS

(1)—¾-yd. 2-line Browning type Z-½.
(1)—¾-yd. Hayward Electric 220-VAC.
(2)—1½-yd. Hayward Electric 230-VDC.
(1)—2-yd. Hayward Electric 230-VDC.

OVERHEAD ELECTRIC TRAVELING CRANES

(1)—3-ton Shaw, 30'0" span, 230-VDC., FL. or CG. OP.
(1)—2- to 5-ton, 30'11" span, A.C. or D.C., FL. OP. with 1 or 2-motor, 2 to 5-ton hoist.
(1)—5-ton P & H, 54'1½" span, 3-motors, 230-VDC. CG. OP.
(1)—20-ton Bedford, 5-ton Aux. H. 230-VDC., 50'0" span, CG. OP.
SPECIAL: 3—5-ton JIB Cranes, masts 23'8", Boom 19'2", Rebuilt, wired with 1 to 5-ton A.C. or D.C. Electric Hoists.

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK. IT IS OFFERED REBUILT IN OUR LARGE MODERN PLANT AND FULLY GUARANTEED.

T. B. MacCABE CO. 4304 CLARISSA ST.
PHILADELPHIA (40) PENNA.

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft., 676 ft., 752 ft. & 1300 ft.

ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft., & 5000 ft.

STEEL TANKS

9—5000 gal., 11,500 and 18,000 gal. cap.
17—1000 bbl., 4000 bbl. and 10,000 bbl. cap.

TANKS BOUGHT AND SOLD

R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

FOR SALE

Slightly used V-5 Greene Furnace 3 Phase, complete for operation on 220 or 440 volt supply at from 250 to 600 KW, takes 1 ton normal charge, includes automatic regulator and for higher voltages up to 13200 transformers can be furnished. Address: GREENE ELECTRIC FURNACE CO., 2702 6th South, SEATTLE 4, WASHINGTON.

FOR SALE

Quincy Air Compressor—4½ x 4 two-cylinder, serial S858601, complete with 7½ H. P. motor, 440v-3ph. on Rockwood Base.

PRICE COMPLETE $250.00

ROCK ISLAND METAL FOUNDRY
ROCK ISLAND ILLINOIS

FOR SALE

1—Used Single phase Electric Steel Furnace, complete with transformers, 12,000 volt primary. Automatic Electrode Control, etc. Purchased new May 1942. Has been producing 7 tons daily. Can make shipment within 3 days. Price F.O.B. shipping point $5500. Address: Box 161, The FOUNDRY, Cleveland.

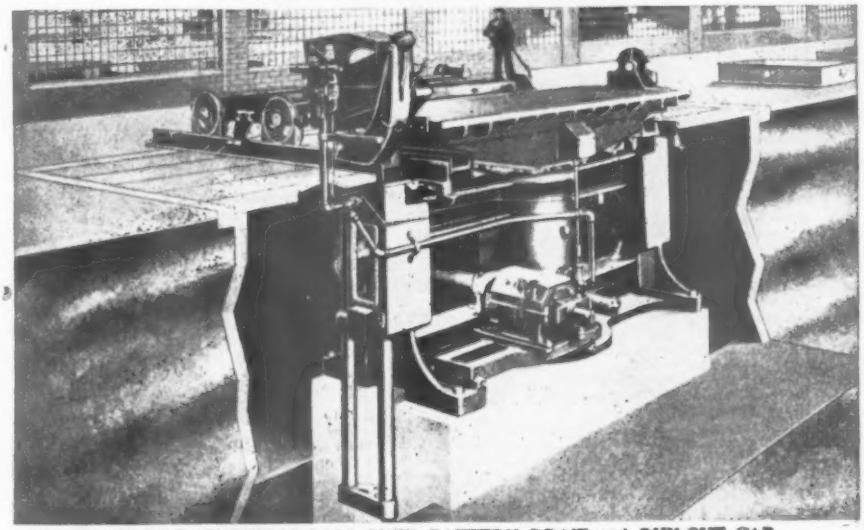
FOR SALE

Model 50 Beardsley & Piper Sand Mullor. Now in operation. Address: The Elyria Foundry, Elyria, Ohio.

SCULLY Reconditioned Foundry Equipment

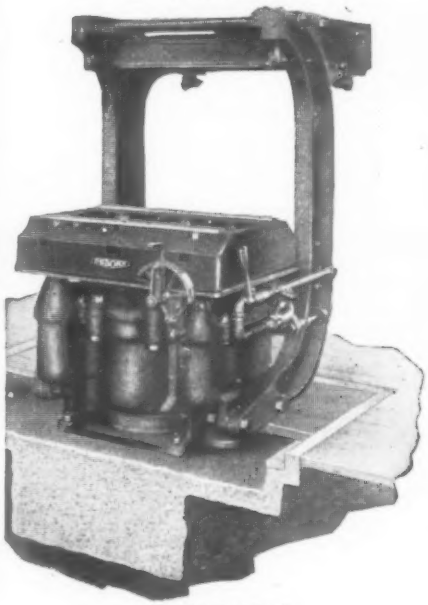
★ ALL SCULLY EQUIPMENT IS REBUILT AND OVERHAULED IN OUR OWN, NEW MACHINE SHOP

OSBORN MOLDING MACHINE



Osborn AIR JOLT, ELECTRIC ROLL-OVER PATTERN DRAW and RUN-OUT CAR
No. 518-E 36 x 124" roll-over table, 36 x 112" jolter.

OSBORN JOLT SQUEEZE & POWER STRIP



No. 703 OSBORN
(Similar to above excepting with roll-off)

No. 703-6 Osborn jolt squeeze and strip, 21 x 28" table, stationary. Length of opening in lifting frame 34", 6" pattern draw, 8" cyl. dia. 1000 lbs. jolting cap. @ 80 lbs. press. Distance from lifting frame to squeeze head 24¼", flask length 44¼" with roll-off conveyor.

No. 703-5 Osborn, same as above, excepting 17 x 35" table.

No. 8 DEMMLER CORE BLOWER, open throat frame—stationary sand magazine—12" dia. opening at top, 17" core box clamping cyl.—with 12" max. draw—cyl. hydraulically controlled—with aux. exhaust valve, largest core will blow 30" long x 18" wide x 9" deep.

MISC. MOLDING MACHINES

No. 112 Arcade portable jolt roll-over and squeeze, pattern draw, table accommodates pattern plates up to 13 x 33"—9" draw, distance between uprights 36".

Arcade No. 10-040 jolt roll-over and squeeze, pit type, 44" distance between uprights, 20 x 34" jolt table, 7" jolt cyl., 18" draw, 42" distance head to swing table.

22" Tabor portable, jar roll-over and draw, 22 x 32" roll-over plate, 600 lbs. cap @ 80 lbs. pressure, 10" draw.

No. 22 Davenport, jolt roll-over draw, 20 x 30" table, 750 lbs. cap. @ 80 lbs. press., 10" draw.

No. 602 Osborn jolt roll-over draw, portable, 24 x 30" flask cap., 900 lbs. cap. @ 80 lbs. press., 10" draw.

No. 28 Davenport jolt roll-over draw, 26½ x 39½" table-pattern draw 12"—jolt cyl. dia. 8"—1500 lbs. cap. @ 80 lbs. press.

Pridmore 30 x 42" power turn-over and drop Electrically operated 24 x 32" jarring machine, 2 HP 220V AC Motor.

Herman Independent Turn-Over and Pattern Drawing Device, 40 x 56" roll-over, 40 x 56" bumper, 3000 lbs. jolting cap. 24" draw.

JOLT SQUEEZERS

No. 76 Arcade straddle portable type with swing-head, 17 x 20" table, 10" dia. cyl.

No. 75-J Osborn, portable, 36" between rods. 10" dia. cyl., 15 x 19" table.

PLAIN JARRING MACHINES

36 x 48" Osborn, 9" dia. cyl. 2000 lbs. cap. @ 80 lbs. press.

60 x 60" Tabor, 14" dia. cyl., 8500 lbs. cap. @ 80 lbs. press.

42 x 60" Tabor, 13" dia. cyl., 7500 lbs. cap. @ 80 lbs. press.

Pangborn 6 ft. dia. TYPE EH-1 CABINET TABLE INSTALLATION, 5 ft. high partition, Abrasive Handling and Reclamation System, Belt and Bucket Type Elevator, Sandblast Pressure Tank.

AMERICAN SANDCUTTERS

Cleveland-American (similar to Model "K") 84" spiral cutting cyl., 36" dia., 92" between tractor wheels, 5" face—equipped with Cleveland 3-phase 60 cycle 220V AC Motors, Cable and Take-Up Reel.

American Model "HP" 50" cutting cyl. 62" between tractor wheels, 2½" face, complete with Louis Allis 220V AC Motors, Cable and Reel.

American Fdry. Model "K" heavy duty type, size 72, equipped with Buda Type "WTU" 20 HP Gas Engine. 72" between tractor wheels, 6" face, having 60" cutting cyl.

CORE TURN-OVER MACHINES

Pridmore Type "H" 22 x 18—8" drop, portable rock-over drop.

MISC. HAND ROLL-OVER MACHINES

International Type "R" 24 x 10" draw, portable, special core turn-over.

Tabor, portable, hand roll-over, hand draw, 1—16-18—8" draw, 1, as above, 20-22—8" draw.

JOLT SQUEEZE STRIPPERS

No. 113 Milwaukee, open end type, portable, 500-lbs. cap. @ 80 lbs., 6" draw, 16 x 35" table.

Osborn No. 82 STRIPPING PLATE JOLT SQUEEZER, 46" between rods, 10" draw, 1200 lbs. jolting cap., 1000 lbs. stripping cap 24 x 36" table, pin lifts 12" part one way 36" the other.

Nicholls Type "D" stationary heavy duty JOLT SQUEEZE & PATTERN DRAW, squeeze piston 14" jolt piston 6", draw 2-6"—distance between strain rods 40" take approx. 15 x 24" flask.

JOLT STRIPPER

Herman, heavy duty type, will take flasks 42" long x 42" wide—3000 lbs. jolting cap. @ 90-100 lbs. press—can be arranged to handle flasks up to 45" x 70".

Osborn No. 550-22 pit type JOLT STRIPPER, stationary pin centers 16 x 32"—table 32 x 36".

3-ton LECTROMELT ELEC. FURNACE size "P" Furnace shell 10'8" dia. inside, ¾" thickness, 66" depth inside complete with Motor Generator Set, tilting and winch motors, Switchboard, Primary Panel 36" wide 7'4" high, Westinghouse OCB Type "F" 300 A, 15,000 Volt, 3 P.S.T., Potential Transf. 13200/120 V, Current Trans. 3 G.E. 300 Amp., 15000V, line dis. switches, and Misc. parts, etc.

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"join the parade"

RECOGNIZING the judgment of other conceded leaders, increasing numbers of foundrymen are "joining the parade" in the consistent use of Famous CORNELL Cupola Flux.

They find it not only *pleasant* to be relieved of a common difficulty but also gratifying to note *tangible results* through its use.

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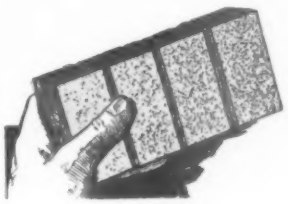

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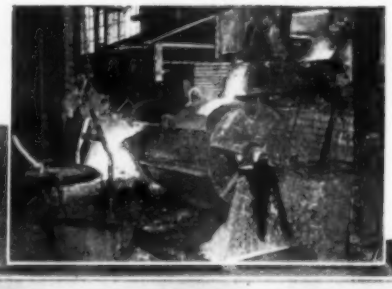

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Metal Pouring Systems

Crane & Monorail Systems for Metal & Mold Handling
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MODERN EQUIPMENT CO.
PORT WASHINGTON, WIS.

Official U. S. Navy Photo

As Uncle Sam's new Destroyer Escorts "Go Into Action" guarding convoys, so do

STEVENS CORE WASHES

"Go Into Action" the instant the hot metal comes in contact with cores and molds coated with Stevens Core Washes. Whether you are working with grey iron, steel, brass or bronze, there is a Stevens Core Wash—developed especially for the "tough jobs." For better castings—economically produced use one of these Stevens Core Washes.

Stevens 114 Core Wash—For Grey Iron

A foundry making Diesel cylinder liners—with molds and cores of dry sand, applying core wash by brushing and spraying, was losing a large number of them to scrap.

They turned to Stevens 114 Core Wash and scrap was reduced to a minimum. Castings were greatly improved. Now they are using it exclusively.

Stevens No. 125 Core Wash—For Brass and Bronze

Developed to seal the core and mold surfaces against penetration or seepage of metal into the sand of cores and molds.

Creamy white; has good suspension and mixes easily with water. Can be applied by dipping, brushing or spraying, being adaptable for molds and cores of brass or bronze. Helps prevent costly chipping and grinding; loss of metal; and even spoiled castings.

Stevens No. 6 Core Wash—For Steel

Developed for use on cores and molds where metal sections are very heavy, especially for cores and molds over which large quantities of molten steel flow when castings are poured.

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